

AUTOMATIC JUDGING DEVICE FOR DOCUMENT DIRECTION AND AUTOMATIC CORRECTING DEVICE FOR DOCUMENT DIRECTION

Publication number: JP8212298 (A)

Publication date: 1996-08-20

Inventor(s): TAKAOKA MAKOTO

Applicant(s): CANON KK

- international: G06K9/03; G06K9/20; G06K9/32; G06K9/46; G06K9/03;
G06K9/20; G06K9/32; G06K9/46; (IPC1-7): G06K9/46; G06K9/03

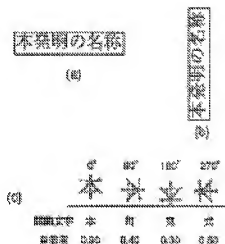
- European: G06K9/32E

Application number: JP19950036079 19950201

Priority number(s): JP19950036079 19950201

Abstract of JP 8212298 (A)

PURPOSE: To automatically judge and correct the direction of a document (document picture). **CONSTITUTION:** Perceiving that characters are most correctly showing the direction of the document, inputted document picture data is character-recognized in four directions of 0 deg., 90 deg., 180 deg. and 270 deg. respectively concerning plural characters in plural character areas, to obtain the average value of the accuracy of character recognition by the directions of the plural characters by the character area and to judge the direction of the largest average value of this average value to be the direction of the document. And, when the judged direction of the document is not correct, document picture data is rotated to be in the correct direction.



[JP,08-212298,A] Published August 20, 1996

NOTICES *

JPO and INPIT are not responsible for any damages caused by the use of this translation.

- 1.This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.**** shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]

[Claim 1]The direction automatic discrimination device of a document comprising:

An image input means which carries out photoelectric conversion of the document information read optically, and is inputted as image data.

A discriminating means which performs character recognition from two or more directions about alphabetic data in image data inputted by said image input hand with reference to a character recognition dictionary which indicated the feature of a character, and this character recognition dictionary, and distinguishes the direction of a document based on this character recognition result.

[Claim 2]The direction automatic discrimination device of a document according to claim 1, wherein said discriminating means distinguishes the direction of character recognition which performs character recognition from two or more directions about alphabetic data in said inputted image data with reference to said character recognition dictionary, and starts a character with the highest accuracy value of character recognition as a direction of a document.

[Claim 3]The direction automatic discrimination device of a document according to claim 1, wherein said discriminating means extracts a character area out of said inputted image data, performs character recognition from two or more directions about two or more alphabetic data in an extracted character area, respectively and distinguishes the direction of a document based on this character recognition result.

[Claim 4]Said discriminating means extracts a character area out of said inputted image data, The direction automatic discrimination device of a document according to claim 1 performing character recognition from two or more directions about two or more alphabetic data in an extracted character area, respectively, and distinguishing a direction with the largest average value according to the direction of an accuracy value of character recognition of two or more characters as a direction of a document.

[Claim 5]Said discriminating means extracts two or more character areas out of said inputted image data, Character recognition is performed from two or more directions, respectively about two or more alphabetic data in two or more extracted character areas, The direction automatic discrimination device of a document according to claim 1 calculating average value of an accuracy value of character recognition according to the direction of two or more characters according to a character area, calculating average value of average value according to said

direction in each character area further, and distinguishing a direction with the largest average value of this average value as a direction of a document.

[Claim 6]The direction automatic correction device of a document comprising:

An image input means which carries out photoelectric conversion of the document information read optically, and is inputted as image data.

A character recognition dictionary which indicated the feature of a character.

A discriminating means which performs character recognition from two or more directions about alphabetic data in image data inputted by said image input hand with reference to this character recognition dictionary, and distinguishes the direction of a document based on this character recognition result.

A compensation means amended so that alphabetic data inputted by said image input means at least may serve as those for Masakata, when the direction of a document was not for Masakata and it is distinguished by this discriminating means.

[Claim 7]The direction automatic correction device of a document according to claim 6, wherein said discriminating means distinguishes the direction of character recognition which performs character recognition from two or more directions about alphabetic data in said inputted image data with reference to said character recognition dictionary, and starts a character with the highest accuracy value of character recognition as a direction of a document.

[Claim 8]The direction automatic correction device of a document according to claim 6, wherein said discriminating means extracts a character area out of said inputted image data, performs character recognition from two or more directions about two or more alphabetic data in an extracted character area, respectively and distinguishes the direction of a document based on this character recognition result.

[Claim 9]Said discriminating means extracts a character area out of said inputted image data, The direction automatic correction device of a document according to claim 6 performing character recognition from two or more directions about two or more alphabetic data in an extracted character area, respectively, and distinguishing a direction with the largest average value according to the direction of an accuracy value of character recognition of two or more characters as a direction of a document.

[Claim 10]Said discriminating means extracts two or more character areas out of said inputted image data. Character recognition is performed from two or more directions, respectively about two or more alphabetic data in two or more extracted character areas, The direction automatic correction device of a document according to claim 6 calculating average value of an accuracy value of character recognition according to the direction of two or more characters according to a character area, calculating average value of average value according to said direction in each character area further, and distinguishing a direction with the largest average value of this average value as a direction of a document.

[Claim 11]The direction automatic correction device of a document according to claim 6 to 10 amending said compensation means so that this image data may serve as those for Masakata by on the whole rotating said inputted image data.

[Claim 12]The direction automatic correction device of a document according to claim 6 to 10 amending said compensation means so that each alphabetic data may serve as those for Masakata by rotating only a character area per character area among said inputted image data.

[Claim 13]The direction automatic correction device of a document according to claim 6 to 10 amending said compensation means so that each alphabetic data may serve as those for Masakata

by reading in a form where alphabetic data is individually rotated among said inputted image data.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the direction automatic discrimination device of a document image which distinguishes automatically the direction of the document (document image) read by optoelectric transducers, such as CCD, and the direction automatic correction device of a document which amends the direction of a document (document image) automatically.

[0002]

[Description of the Prior Art] Although recognizing a character generally out of the draft information (image data) read by optical readers, such as a scanner, is conventionally performed with the information processor. In order that character recognition might select a character candidate out of the feature when the character has turned to those for Masakata to the last, when image data rotated and was read at 90 degrees, 180 degrees, etc., character recognition could not be performed correctly but a completely different character code was outputted.

[0003] For example, when the character has turned to those for Masakata like drawing 10 (a) in the case of the character "quantity" shown in drawing 10, recognize it as "quantity" correctly, but. Erroneous recognition is carried out to "***" by 270-degree rotation like drawing 10 (b), erroneous recognition is carried out to a "character" by 180-degree rotation like drawing 10 (c), and recognition becomes impossible by 90-degree rotation like drawing 10 (d) (in addition, this recognition result is a thing on expedient of explanation to the last.). It differs from a actual result.

[0004] Then, in order to perform character recognition correctly, when the direction of a document was not right, the direction of a manuscript was corrected by the help and manuscript reading and character recognition were performed again.

[0005] However, it is becoming difficult for the process speed of a scanner to improve, and for processing a lot of manuscripts, since the manuscript automatic feeding function called an autofeeder begins to be attached to increase, and to amend the direction of a manuscript one by one by a help.

[0006] The contents of a document on a manuscript are expressed by various kinds of patterns, such as vertical writing and lateral writing. Namely, the document of lateral writing in every A4 length (refer to drawing 11 (a): well used by the Japanese horizontally written sentence, an English document, etc.), the document (drawing 11 (b) referring-to:- -- a document with a long sentence.) of lateral writing by every A4 side. Are well used by the case where the reduction copy of the document for OHIP and the documents, such as A3 and B4, is carried out etc. There are various kinds of patterns, such as a document (refer to drawing 11 (d)) of vertical writing, in the document (refer to drawing 11 (c): when the reduction copy of the two sheets is continuously carried out for A4 document, used well) of lateral writing in which the column changed in right in the middle by every A4 side, and every A4 length.

[0007] On the other hand, the direction of the picture displayed on a monitor will be decided by the scanning direction (the direction of image reading) of the scanner at the time of carrying out

an image input. For this reason, when a manuscript is read with a posture the scanning direction of a scanner and whose direction of the character string of a document correspond, as shown in drawing 12 (a), a document is expressed as an original posture.

[0008]However, since the direction of a manuscript is decided uniquely in the case of the scanner of A4, As a manuscript cannot be read with the posture which coincided the scanning direction of a scanner, and the direction of the character string of a document, for example, it was shown in drawing 12 (b), there was a case where it is displayed after 90 degrees of documents have rotated from the original posture, and it became very difficult to read.

[0009]In order to cancel the erroneous recognition of the above characters, and the difficulty of reading on a monitor, the information processor provided with the direction of document image automatic distinction / rotary function is realized conventionally.

[0010]The typical thing of the conventional direction of document image automatic distinction technique, As shown in drawing 13, the directivity of the portion which has a line as shown in a table based on an area separation result is seen, The projection (histogram) of the lengthwise direction and transverse direction of the method which distinguishes the direction which is dividing the character area into the transverse direction by the long line as (refer to the "a" of drawing 13 (a)) and a direction of the document image, and a document is detected, It had distinguished from the oblong of the rectangular area which could divide, looked at and judged condition, or separated (refer to the "b" of drawing 13 (b)), and a field, and matched the feature of the character area, and the feature (refer to "c" of drawing 13 (b)) of being longwise.

[0011]And based on the direction of a document image distinguished with these techniques, the rotating process of the document image data was carried out, and character recognition processing was performed to the rotated picture. In order to say that the expectation for the right character recognition based on such a direction of a document wants to arrange a lot of documents in recent years, it has risen to the large quantity of application of electronic filing etc., development of DTP, a copying machine, etc. dramatically with development of the apparatus which processes a document.

[0012]

[Problem(s) to be Solved by the Invention]However, the conventional document direction discrimination method had the low accuracy of direction discrimination. That is, in the case of the document in which no line of a table is in the case of the distinction method using the line of the table in a document, or the document having contained the line which carries out in-every-direction mixture, direction discrimination may have been mistaken.

[0013]Although it was comparatively high-precision, when it was the document in which a figure and natural drawing are contained in the document, direction discrimination may have been mistaken by the document into which, as for the case of the method which detects **** in every direction, the line and the paragraph are divided firmly only in written form.

[0014]Also in any of a method based on the feature oblong [the method using the line of a table, the method which detects **** in every direction, and a character area], and longwise, it was difficult to distinguish rotation (0 degree and 180 degrees), rotation (90 degrees and 180 degrees), etc., and the accuracy of direction discrimination was low.

[0015]This invention was made under such a background and the 1st purpose is to provide the direction automatic discrimination device of a document which can distinguish the direction of a document (document image) with high precision automatically.

[0016]The 2nd purpose of this invention is to provide the direction automatic correction device of a document which distinguishes the direction of a document (document image) with high

precision automatically, and can amend it.

[0017]

[Means for Solving the Problem]In order to attain the 1st purpose of the above, the direction automatic discrimination device of a document according to claim 1 is provided with the following.

An image input means which carries out photoelectric conversion of the document information read optically, and is inputted as image data.

A character recognition dictionary which indicated the feature of a character.

A discriminating means which performs character recognition from two or more directions about alphabetic data in image data inputted by said image input hand with reference to this character recognition dictionary, and distinguishes the direction of a document based on this character recognition result.

[0018]In order to attain the 1st purpose of the above, in the direction automatic discrimination device of a document according to claim 2. Said discriminating means according to claim 1 performs character recognition from two or more directions about alphabetic data in said inputted image data with reference to said character recognition dictionary, and it is constituted so that the direction of character recognition concerning a character with the highest accuracy value of character recognition may be distinguished as a direction of a document.

[0019]In order to attain the 1st purpose of the above, in the direction automatic discrimination device of a document according to claim 3. As for said discriminating means according to claim 1, said discriminating means extracts a character area out of said inputted image data, performs character recognition from two or more directions about two or more alphabetic data in an extracted character area, respectively, and it is constituted so that the direction of a document may be distinguished based on this character recognition result.

[0020]In order to attain the 1st purpose of the above, in the direction automatic discrimination device of a document according to claim 4. Said discriminating means according to claim 1 extracts a character area out of said inputted image data, Character recognition is performed from two or more directions about two or more alphabetic data in an extracted character area, respectively, and it is constituted so that a direction with the largest average value according to the direction of an accuracy value of character recognition of two or more characters may be distinguished as a direction of a document.

[0021]In order to attain the 1st purpose of the above, in the direction automatic discrimination device of a document according to claim 5. Said discriminating means according to claim 1 extracts two or more character areas out of said inputted image data, Character recognition is performed from two or more directions, respectively about two or more alphabetic data in two or more extracted character areas, Average value of an accuracy value of character recognition according to the direction of two or more characters is calculated according to a character area, and average value of average value according to said direction in each character area is calculated further, and it is constituted so that a direction with the largest average value of this average value may be distinguished as a direction of a document.

[0022]In order to attain the 2nd purpose of the above, the direction automatic correction device of a document according to claim 6 is provided with the following.

An image input means which carries out photoelectric conversion of the document information read optically, and is inputted as image data.

A character recognition dictionary which indicated the feature of a character.

A discriminating means which performs character recognition from two or more directions about alphabetic data in image data inputted by said image input hand with reference to this character recognition dictionary, and distinguishes the direction of a document based on this character recognition result.

A compensation means amended so that alphabetic data inputted by said image input means at least may serve as those for Masakata, when the direction of a document was not for Masakata and it is distinguished by this discriminating means.

[0023]In order to attain the 2nd purpose of the above, in the direction automatic correction device of a document according to claim 7. Said discriminating means according to claim 6 performs character recognition from two or more directions about alphabetic data in said inputted image data with reference to said character recognition dictionary, and it is constituted so that the direction of character recognition concerning a character with the highest accuracy value of character recognition may be distinguished as a direction of a document.

[0024]In order to attain the 2nd purpose of the above, in the direction automatic correction device of a document according to claim 8. Said discriminating means according to claim 6 extracts a character area out of said inputted image data, performs character recognition from two or more directions about two or more alphabetic data in an extracted character area, respectively, and it is constituted so that the direction of a document may be distinguished based on this character recognition result.

[0025]In order to attain the 2nd purpose of the above, in the direction automatic correction device of a document according to claim 9. Said discriminating means according to claim 6 extracts a character area out of said inputted image data, Character recognition is performed from two or more directions about two or more alphabetic data in an extracted character area, respectively, and it is constituted so that a direction with the largest average value according to the direction of an accuracy value of character recognition of two or more characters may be distinguished as a direction of a document.

[0026]In order to attain the 2nd purpose of the above, in the direction automatic correction device of a document according to claim 10. Said discriminating means according to claim 6 extracts two or more character areas out of said inputted image data, Character recognition is performed from two or more directions, respectively about two or more alphabetic data in two or more extracted character areas, Average value of an accuracy value of character recognition according to the direction of two or more characters is calculated according to a character area, and average value of average value according to said direction in each character area is calculated further, and it is constituted so that a direction with the largest average value of this average value may be distinguished as a direction of a document.

[0027]In order to attain the 2nd purpose of the above, said compensation means according to claim 6 to 10 comprises a direction automatic correction device of a document according to claim 11 by on the whole rotating said inputted image data so that this image data may serve as those for Masakata and it may amend.

[0028]In order to attain the 2nd purpose of the above, said compensation means according to claim 6 to 10 comprises a direction automatic correction device of a document according to claim 12 by rotating only a character area per character area among said inputted image data so that each alphabetic data may serve as those for Masakata and it may amend.

[0029]In order to attain the 2nd purpose of the above, said compensation means according to claim 6 to 10 comprises a direction automatic correction device of a document according to

claim 13 by reading in a form where alphabetic data is individually rotated among said inputted image data so that each alphabetic data may serve as those for Masakata and it may amend.

[0030]

[Function]In the direction automatic discrimination device of a document according to claim 1, said discriminating means, The direction of a document (document image) is automatically distinguished with high precision by performing character recognition from two or more directions about the alphabetic data in the image data inputted by said image input hand with reference to said character recognition dictionary, and distinguishing the direction of a document based on this character recognition result.

[0031]In the direction automatic discrimination device of a document according to claim 2, said discriminating means according to claim 1, The same operation and effect as claim 1 are acquired by performing character recognition from two or more directions about the alphabetic data in said inputted image data with reference to said character recognition dictionary, and distinguishing the direction of character recognition concerning a character with the highest accuracy value of character recognition as a direction of a document.

[0032]In the direction automatic discrimination device of a document according to claim 3, said discriminating means according to claim 1, When said discriminating means performs character recognition from two or more directions, respectively about two or more alphabetic data in the character area which extracted the character area out of said inputted image data, and was extracted and distinguishes the direction of a document based on this character recognition result, the same operation and effect as claim 1 are acquired.

[0033]In the direction automatic discrimination device of a document according to claim 4, said discriminating means according to claim 1, Extract a character area out of said inputted image data, and character recognition is performed from two or more directions about two or more alphabetic data in the extracted character area, respectively, By distinguishing a direction with the largest average value according to the direction of the accuracy value of the character recognition of two or more characters as a direction of a document, the same operation and effect as claim 1 are acquired.

[0034]In the direction automatic discrimination device of a document according to claim 5, said discriminating means according to claim 1, Extract two or more character areas out of said inputted image data, and character recognition is performed from two or more directions, respectively about two or more alphabetic data in two or more extracted character areas, The same operation and effect as claim 1 are acquired by calculating the average value of the accuracy value of the character recognition according to the direction of two or more characters according to a character area, calculating the average value of the average value according to said direction in each character area further, and distinguishing a direction with the largest average value of this average value as a direction of a document.

[0035]In the direction automatic correction device of a document according to claim 6, said discriminating means, Character recognition is performed from two or more directions about the alphabetic data in the image data inputted by said image input hand with reference to said character recognition dictionary, Based on this character recognition result, distinguish the direction of a document, and said compensation means, When the direction of a document was not for Masakata and it is distinguished by said discriminating means, by amending so that the alphabetic data inputted by said image input means at least may serve as those for Masakata, the direction of a document (document image) is distinguished with high precision automatically, and is amended.

[0036]In the direction automatic correction device of a document according to claim 7, said discriminating means according to claim 6, The same operation and effect as claim 6 are acquired by performing character recognition from two or more directions about the alphabetic data in said inputted image data with reference to said character recognition dictionary, and distinguishing the direction of character recognition concerning a character with the highest accuracy value of character recognition as a direction of a document.

[0037]In the direction automatic correction device of a document according to claim 8, said discriminating means according to claim 6, The same operation and effect as claim 6 are acquired by extracting a character area out of said inputted image data, performing character recognition from two or more directions about two or more alphabetic data in the extracted character area, respectively, and distinguishing the direction of a document based on this character recognition result.

[0038]In the direction automatic correction device of a document according to claim 9, said discriminating means according to claim 6, Extract a character area out of said inputted image data, and character recognition is performed from two or more directions about two or more alphabetic data in the extracted character area, respectively, By distinguishing a direction with the largest average value according to the direction of the accuracy value of the character recognition of two or more characters as a direction of a document, the same operation and effect as claim 6 are acquired.

[0039]In the direction automatic correction device of a document according to claim 10. Said discriminating means according to claim 6 extracts two or more character areas out of said inputted image data, Character recognition is performed from two or more directions, respectively about two or more alphabetic data in two or more extracted character areas, The same operation and effect as claim 6 are acquired by calculating the average value of the accuracy value of the character recognition according to the direction of two or more characters according to a character area, calculating the average value of the average value according to said direction in each character area further, and distinguishing a direction with the largest average value of this average value as a direction of a document.

[0040]In the direction automatic correction device of a document according to claim 11, the same operation and effect as claim 6 are acquired by amending said compensation means according to claim 6 to 10 so that this image data may serve as those for Masakata by on the whole rotating said inputted image data.

[0041]In the direction automatic correction device of a document according to claim 12. The same operation and effect as claim 6 are acquired by amending said compensation means according to claim 6 to 10 so that each alphabetic data may serve as those for Masakata by rotating only a character area per character area among said inputted image data.

[0042]In the direction automatic correction device of a document according to claim 13. The same operation and effect as claim 6 are acquired by amending so that each alphabetic data may serve as those for Masakata by reading said compensation means according to claim 6 to 10 in the form where alphabetic data is individually rotated among said inputted image data.

[0043]

[Example]Hereafter, the example of this invention is described, referring to drawings.

[0044]Drawing 1 is the direction automatic discrimination device of a document by the example of this invention, and the direction automatic correction device of a document a system configuration figure of the applied data processing system, and this system, It is the system which had the input part and image processing portion of a picture, and the intelligent input

device or the independent input device was connected with the computer via I/F, and was made intelligent by a scanner device or copying machine.

[0045]The scanner part 1 is a means to read a document manuscript optically, to carry out photoelectric conversion, and to input as digital image data. If an autfeeder is attached to this scanner part 1, it is possible to carry out the continuation input of the manuscript of two or more sheets. CPU / memory part 2 performs various control, and since image data is saved temporarily, there is.

[0046]Character recognition / direction discrimination part 3 notes that the character expresses the direction of a document most correctly, Character recognition is performed for several kinds of character areas in a document from a direction (0 degree, 90 degrees, 180 degrees, and 270 degrees), and let the highest-precision direction be the direction of a document in the accuracy (the degree of confidence of character recognition: distance over the feature distribution of a character) of the character recognition in for these all directions.

[0047]The area separation section 4 is a block which performs processing which divides a character part, a figure section, a natural image area, the front part, etc. into a rectangular field, and adds the attributes (character part etc.) of each field from document image data as pretreatment for performing character recognition and direction discrimination processing by character recognition / direction discrimination part 3.

[0048]The memory storage 5 is constituted by a hard disk, magneto-optical disc, etc., and since various processing results (image data, an area separation result, a character recognition result, etc.) are saved, it is used, for example. The I/F part 6 is constituted by SCSI, RS232C, etc., and it is provided in order to transmit data to the exterior. OK, via the I/F part 6, from movable memory storage, such as a magneto-optical disc, the computer 7 obtains data and uses information. The printer section 8 carries out the printout of the image data etc. which were processed [various] based on area separation information and character recognition information to the image data inputted from the scanner part 1.

[0049]Next, the outline of the direction of document automatic distinction and amendment in this example, and character recognition processing is explained according to the flow chart of drawing 2.

[0050]The image data (a binary format image or a multi valued image) inputted by the scanner part 1 is first divided into a rectangular field by the area separation section 4 according to attributes, such as a character part, a figure section, a natural image area, and the front part (Step S1, S2). Here, the area information surrounded with the rectangle is created actually.

[0051]Next, the rectangle information on a character area is extracted from each attribute (Step S3). Here, character areas are a text part, a title part, a character in front, a caption part of a figure, etc. For example, in the case of the document of drawing 3 (a) and (c), the rectangle information on a character area as shown in drawing 3 (b) and (d), respectively is extracted. And document direction discrimination is performed using several blocks in these (step S4). As a result, if the direction of a document is for Masakata, character recognition processing will be succeedingly performed to the alphabetic block in a picture (Step S7).

[0052]On the other hand, if the direction of a document is the unjust direction, a right direction will be made to rotate image data (Step S5). And area separation is performed to a rotational image and the compensation process of area separation information is performed (Step S6). How for this to amend a difference of the area separation information accompanying image rotation, and to perform area separation processing again to all the rotational image data as one method. Another has the method of applying address translation to an area separation result. A result

differs between the area separation processing which area separation processing performed in the early stage since the picture generally assumed those for Masakata, and the area separation processing performed to rotational image data in many cases. So, it is desirable to take the former method.

[0053]Next, it progresses to Step S7 and character recognition of the character area block in rotational image data is carried out by a character recognition processing system. As a result, area separation information and character recognition information are eventually acquired for a case with [both] rotation-less/rotation (Step S8).

[0054]This processing result is transmitted to the computer 7 via the I/F part 6, and is used with the application software of the filing on the computer 7, etc. In the system transmitted to the memory storage 5, picture information is inputted continuously, next it is used for the method used in batch processing of reading the information collectively. In the system furthermore transmitted to the printer 8, when the printer 8 has the function to interpret a Page Description Language, it is used for reconstructing a document by character recognition and processing of area separation by reverse PDL (how to create a Page Description Language from image data), or making a fair copy.

[0055]Next, the technique of document direction discrimination using character recognition processing is explained.

[0056][Area separation processing] The black pixel of document image data is detected and the rectangular frame of a black pixel block is created with border-line pursuit or a labeling method. Next, the black pixel density in the rectangle, the existence of a contiguity rectangular block, a rectangular horizontal-to-vertical ratio, etc. are made into a decision criterion, and character areas (a title, a duty, a caption, etc.), a graphic region, a natural drawing field, a table area, etc. are distinguished. The rectangle information on a character area is distinguished from this processing result.

[0057][Character recognition processing] The one methods of character recognition processing include feature vector extraction and a comparison method. For example, as shown in drawing 4 (a), suppose that the character area containing the character "book" was distinguished. As the first step, character logging processing is performed about this character area (refer to drawing 4 (b)). This is the processing which starts the rectangle of one character, and if the state of black pixel continuity is detected, it will be called for. As a second stage story, a single character is started to the picture element block of mxn (for example, 64x64) (refer to drawing 4 (c)). And the distribution direction of a black pixel is extracted from the inside using a 3x3-pixel window (direction-vector information: refer to drawing 4 (d)).

[0058]Drawing 4 (d) illustrates a part of direction vector information, shifts a 3x3 above-mentioned pixels window, and acquires tens of direction vector information. This vector information serves as the feature of a character. The contents of the character recognition dictionary beforehand remembered to be this feature vector are compared, and the feature extracts a character in an order from the nearest character to a feature vector. In this case, the feature becomes the 1st candidate of **, the 2nd candidate, the 2nd candidate, and -- in near turn at a feature vector. The nearness of the feature to this feature vector serves as a numerical value of the nearness of distance of confidence to that character, i.e., the degree of character recognition, (accuracy).

[0059][Character direction discrimination processing] Although it does in this way and the degree of confidence of character recognition is called for, the character direction discrimination processing based on the degree of confidence is explained using the example "the name of this

invention" shown in drawing 5.

[0060]Drawing 5 (a) is a Masakata-oriented sentence and the sentence which 270 degrees of drawing 5 (b) rotated. If a "book" is observed here, when distinguishing a character direction, as shown in drawing 5 (c), character recognition is performed about one character "book" from four directions (0 degree, 90 degrees, 180 degrees, and 270 degrees). Each angle of rotation should just change how to read the field of character rectangles, and does not need to rotate a manuscript in particular.

[0061]The character recognition results in each angle of rotation differ mutually, as shown in drawing 5 (c). The temporary character recognition result and the degree of confidence for explanation are shown in drawing 5 (c).

It does not necessarily become this passage actually.

[0062]In drawing 5 (c), when character recognition is performed from for Masakata (0 degree), it is correctly recognized as a "book" and the degree of confidence also serves as 0.90 and a high value. When character recognition is performed from the direction rotated 90 degrees, erroneous recognition is carried out to a "town" and the degree of confidence also falls with 0.40. Thus, it is because that erroneous recognition occurs and the degree of confidence also falls performed character recognition based on the feature vector at the time of seeing from the rotated direction. Also when 180 degrees of character recognition are similarly performed from the direction rotated 270 degrees, erroneous recognition occurs and the degree of confidence also falls. If the degree of confidence according to the direction of character recognition is a complicated character, in a certain degree, the difference will appear notably.

[0063]In a Masakata-oriented case, since the degree of confidence is high No. 1, the result of drawing 5 (c) is judged that a possibility of a document that it is suitable for Masakata is high. In order to raise the accuracy of character direction distinction, character recognition is similarly performed from four directions about two or more characters within the same block. Since there is a possibility of carrying out incorrect pine ***** of the character direction about a special character string when a character direction is distinguished only with one block, character recognition same about two or more blocks is performed.

[0064]And about each block, the average value of the degree of confidence according to the 4 directions of each recognition object character within the block concerned is calculated, further, the average value over the average value of the degree of confidence according to the 4 directions in each block is calculated, and a direction with this highest average value is authorized as a character direction (the direction of a document).

[0065]Thus, it becomes possible by [within the same block] authorizing the character direction of two or more characters further with the degree of confidence of two or more characters within the same block to distinguish the direction of a character (document) with high precision, without authorizing a character direction with the degree of confidence of only one character. However, even if a character direction is distinguished with the degree of confidence of only one character or it distinguishes a character direction with the degree of confidence of two or more characters within the same block, it cannot be overemphasized that a character direction can be distinguished from the former with high precision.

[0066]Next, when the discriminated result of a character direction (the direction of a document) is the direction of [other than for Masakata], an original image is rotated so that a character direction may become for Masakata. It is possible to perform this rotation simply by publicly known art using CPU / memory 2 of drawing 1, and that explanation is omitted.

[0067]The original image data shown in drawing 6 (a), the area separation data shown in drawing 6 (b), and the character recognition information shown in drawing 6 (c) can be acquired by the above processings. These information is used by applications, such as electronic filing, document plastic surgery, and DTP, as mentioned above.

[0068]"header" which shows that it is area separation data as the form of area separation data was shown in drawing 6 (b). The information on each field (block) which was constituted by identifier [of the separated field] "rect1" - "rectn4", and was distinguished by this identifier. The number "order" of a block, the attribute (a character part, a figure section, etc.) of a block "att", The coordinate value at the upper left of a block "x1" and "y1", the width "w" of a block. The height "h" of a block, vertical writing, or "direction" that shows lateral writing. It is constituted by the attribute "upperAtt" of "SelfID" which is ID of the block concerned, "upperID" which is ID of the parent block which includes the block concerned, and a parent block, and the reserve area "reserve."

[0069]The character recognition information "OCR1" have "header" which shows that it is character recognition information as character recognition information was shown in drawing 6 (c), for example, concerning single characters, such as a "book", etc.. It is constituted by the combination information on "blk header" equivalent to the above-mentioned rect1 grade which shows the block with which the character concerned is contained.

[0070]And each character recognition information, such as "OCR1", The 1st according to "type" and the degree of confidence of the above-mentioned character recognition which show whether it is a character or it is blank - 5th candidates-characters "character 1" - "character 5". It is constituted by the logging position "x1" of the character concerned and "y1", the width of character "w" concerned, the height of character "h" concerned, and the reserve area "reserve."

[0071]As a result of [which is [Other Example(s)]] distinguishing the direction of a document in the above-mentioned example, when should not turn to those for Masakata and they should have been rotated, the whole original image data was rotated, and character recognition was performed, but it is also possible to perform character recognition, without rotating original image data.

[0072]In this case, only character-rectangles data is made to rotate and copy on another memory, and what is necessary is just to perform character recognition to that rectangular image data, as shown in drawing 7 if the rectangle information on a character area is acquired.

[0073]As shown in drawing 8, without making it rotate, image data performs the character end to a character-rectangles field, when it reads each character, where the read-out direction is rotated, may be read, and may perform character recognition (refer to step S9 of drawing 9). Since other steps of the flow chart of drawing 9 are the same as that of drawing 1 almost, it is only ***** and the explanation omits the same step number.

[0074]This invention can be applied not only to Japanese but to the document concerning other languages, for example, without being limited to each above-mentioned example. Since the document in particular concerning English etc. does not have a vertical writing document, it can distinguish the direction of a document to high degree of accuracy more.

[0075]

[Effect of the Invention]As mentioned above, as explained in detail, in this invention, it notes that the character expresses the direction of a document most correctly. Character recognition is performed from two or more directions about the same character, the highest direction of character recognition precision is distinguished as a direction of a document, and the direction of a document was amended if needed based on the discriminated result.

Therefore, the direction of a document (document image) can be distinguished with high precision automatically, and the direction of a document can be amended, and it becomes possible to obtain a highly precise character recognition result, without through a help.

TECHNICAL FIELD

[Industrial Application] This invention relates to the direction automatic discrimination device of a document image which distinguishes automatically the direction of the document (document image) read by optoelectric transducers, such as CCD, and the direction automatic correction device of a document which amends the direction of a document (document image) automatically.

PRIOR ART

[Description of the Prior Art] Although recognizing a character generally out of the draft information (image data) read by optical readers, such as a scanner, is conventionally performed with the information processor, In order that character recognition might select a character candidate out of the feature when the character has turned to those for Masakata to the last, when image data rotated and was read at 90 degrees, 180 degrees, etc., character recognition could not be performed correctly but a completely different character code was outputted.

[0003] For example, when the character has turned to those for Masakata like drawing 10 (a) in the case of the character "quantity" shown in drawing 10, recognize it as "quantity" correctly, but. Erroneous recognition is carried out to "***" by 270-degree rotation like drawing 10 (b), erroneous recognition is carried out to a "character" by 180-degree rotation like drawing 10 (c), and recognition becomes impossible by 90-degree rotation like drawing 10 (d) (in addition, this recognition result is a thing on expedient of explanation to the last.) It differs from a actual result.

[0004] Then, in order to perform character recognition correctly, when the direction of a document was not right, the direction of a manuscript was corrected by the help and manuscript reading and character recognition were performed again.

[0005] However, it is becoming difficult for the process speed of a scanner to improve, and for processing a lot of manuscripts, since the manuscript automatic feeding function called an autofeeder begins to be attached to increase, and to amend the direction of a manuscript one by one by a help.

[0006] The contents of a document on a manuscript are expressed by various kinds of patterns, such as vertical writing and lateral writing. Namely, the document of lateral writing in every A4 length (refer to drawing 11 (a)): well used by the Japanese horizontally written sentence, an English document, etc.), the document (drawing 11 (b) referring-to: -- a document with a long sentence.) of lateral writing by every A4 side. Are well used by the case where the reduction copy of the document for OHP and the documents, such as A3 and B4, is carried out etc. There are various kinds of patterns, such as a document (refer to drawing 11 (d)) of vertical writing, in the document (refer to drawing 11 (c)): when the reduction copy of the two sheets is continuously carried out for A4 document, used well) of lateral writing in which the column changed in right in the middle by every A4 side, and every A4 length.

[0007] On the other hand, the direction of the picture displayed on a monitor will be decided by

the scanning direction (the direction of image reading) of the scanner at the time of carrying out an image input. For this reason, when a manuscript is read with a posture the scanning direction of a scanner and whose direction of the character string of a document correspond, as shown in drawing 12 (a), a document is expressed as an original posture.

[0008]However, since the direction of a manuscript is decided uniquely in the case of the scanner of A4, As a manuscript cannot be read with the posture which coincided the scanning direction of a scanner, and the direction of the character string of a document, for example, it was shown in drawing 12 (b), there was a case where it is displayed after 90 degrees of documents have rotated from the original posture, and it became very difficult to read.

[0009]In order to cancel the erroneous recognition of the above characters, and the difficulty of reading on a monitor, the information processor provided with the direction of document image automatic distinction / rotary function is realized conventionally.

[0010]The typical thing of the conventional direction of document image automatic distinction technique, As shown in drawing 13, the directivity of the portion which has a line as shown in a table based on an area separation result is seen, The projection (histogram) of the lengthwise direction and transverse direction of the method which distinguishes the direction which is dividing the character area into the transverse direction by the long line as (refer to the "a" of drawing 13 (a)) and a direction of the document image, and a document is detected, It had distinguished from the oblong of the rectangular area which could divide, looked at and judged condition, or separated (refer to the "b" of drawing 13 (b)), and a field, and matched the feature of the character area, and the feature (refer to "c" of drawing 13 (b)) of being longwise.

[0011]And based on the direction of a document image distinguished with these techniques, the rotating process of the document image data was carried out, and character recognition processing was performed to the rotated picture. In order to say that the expectation for the right character recognition based on such a direction of a document wants to arrange a lot of documents in recent years, it has risen to the large quantity of application of electronic filing etc., development of DTP, a copying machine, etc. dramatically with development of the apparatus which processes a document.

EFFECT OF THE INVENTION

[Effect of the Invention]As mentioned above, as explained in detail, in this invention, it notes that the character expresses the direction of a document most correctly, Character recognition is performed from two or more directions about the same character, the highest direction of character recognition precision is distinguished as a direction of a document, and the direction of a document was amended if needed based on the discriminated result.

Therefore, the direction of a document (document image) can be distinguished with high precision automatically, and the direction of a document can be amended, and it becomes possible to obtain a highly precise character recognition result, without through a help.

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention]However, the conventional document direction discrimination method had the low accuracy of direction discrimination. That is, in the case of the document in which no line of a table is in the case of the distinction method using the line of the table in a document, or the document having contained the line which carries out in-every-

direction mixture, direction discrimination may have been mistaken.

[0013]Although it was comparatively high-precision, when it was the document in which a figure and natural drawing are contained in the document, direction discrimination may have been mistaken by the document into which, as for the case of the method which detects **** in every direction, the line and the paragraph are divided firmly only in written form.

[0014]Also in any of a method based on the feature oblong [the method using the line of a table, the method which detects **** in every direction, and a character area], and longwise, it was difficult to distinguish rotation (0 degree and 180 degrees), rotation (90 degrees and 180 degrees), etc., and the accuracy of direction discrimination was low.

[0015]This invention was made under such a background and the 1st purpose is to provide the direction automatic discrimination device of a document which can distinguish the direction of a document (document image) with high precision automatically.

[0016]The 2nd purpose of this invention is to provide the direction automatic correction device of a document which distinguishes the direction of a document (document image) with high precision automatically, and can amend it.

MEANS

[Means for Solving the Problem]In order to attain the 1st purpose of the above, the direction automatic discrimination device of a document according to claim 1 is provided with the following.

An image input means which carries out photoelectric conversion of the document information read optically, and is inputted as image data.

A character recognition dictionary which indicated the feature of a character.

A discriminating means which performs character recognition from two or more directions about alphabetic data in image data inputted by said image input hand with reference to this character recognition dictionary, and distinguishes the direction of a document based on this character recognition result.

[0018]In order to attain the 1st purpose of the above, in the direction automatic discrimination device of a document according to claim 2. Said discriminating means according to claim 1 performs character recognition from two or more directions about alphabetic data in said inputted image data with reference to said character recognition dictionary, and it is constituted so that the direction of character recognition concerning a character with the highest accuracy value of character recognition may be distinguished as a direction of a document.

[0019]In order to attain the 1st purpose of the above, in the direction automatic discrimination device of a document according to claim 3. As for said discriminating means according to claim 1, said discriminating means extracts a character area out of said inputted image data, performs character recognition from two or more directions about two or more alphabetic data in an extracted character area, respectively, and it is constituted so that the direction of a document may be distinguished based on this character recognition result.

[0020]In order to attain the 1st purpose of the above, in the direction automatic discrimination device of a document according to claim 4. Said discriminating means according to claim 1 extracts a character area out of said inputted image data, Character recognition is performed from two or more directions about two or more alphabetic data in an extracted character area, respectively, and it is constituted so that a direction with the largest average value according to

the direction of an accuracy value of character recognition of two or more characters may be distinguished as a direction of a document.

[0021] In order to attain the 1st purpose of the above, in the direction automatic discrimination device of a document according to claim 5. Said discriminating means according to claim 1 extracts two or more character areas out of said inputted image data, Character recognition is performed from two or more directions, respectively about two or more alphabetic data in two or more extracted character areas, Average value of an accuracy value of character recognition according to the direction of two or more characters is calculated according to a character area, and average value of average value according to said direction in each character area is calculated further, and it is constituted so that a direction with the largest average value of this average value may be distinguished as a direction of a document.

[0022] In order to attain the 2nd purpose of the above, the direction automatic correction device of a document according to claim 6 is provided with the following.

An image input means which carries out photoelectric conversion of the document information read optically, and is inputted as image data.

A character recognition dictionary which indicated the feature of a character.

A discriminating means which performs character recognition from two or more directions about alphabetic data in image data inputted by said image input hand with reference to this character recognition dictionary, and distinguishes the direction of a document based on this character recognition result.

A compensation means amended so that alphabetic data inputted by said image input means at least may serve as those for Masakata, when the direction of a document was not for Masakata and it is distinguished by this discriminating means.

[0023] In order to attain the 2nd purpose of the above, in the direction automatic correction device of a document according to claim 7. Said discriminating means according to claim 6 performs character recognition from two or more directions about alphabetic data in said inputted image data with reference to said character recognition dictionary, and it is constituted so that the direction of character recognition concerning a character with the highest accuracy value of character recognition may be distinguished as a direction of a document.

[0024] In order to attain the 2nd purpose of the above, in the direction automatic correction device of a document according to claim 8. Said discriminating means according to claim 6 extracts a character area out of said inputted image data, performs character recognition from two or more directions about two or more alphabetic data in an extracted character area, respectively, and it is constituted so that the direction of a document may be distinguished based on this character recognition result.

[0025] In order to attain the 2nd purpose of the above, in the direction automatic correction device of a document according to claim 9. Said discriminating means according to claim 6 extracts a character area out of said inputted image data, Character recognition is performed from two or more directions about two or more alphabetic data in an extracted character area, respectively, and it is constituted so that a direction with the largest average value according to the direction of an accuracy value of character recognition of two or more characters may be distinguished as a direction of a document.

[0026] In order to attain the 2nd purpose of the above, in the direction automatic correction device of a document according to claim 10. Said discriminating means according to claim 6 extracts two or more character areas out of said inputted image data, Character recognition is

performed from two or more directions, respectively about two or more alphabetic data in two or more extracted character areas, Average value of an accuracy value of character recognition according to the direction of two or more characters is calculated according to a character area, and average value of average value according to said direction in each character area is calculated further, and it is constituted so that a direction with the largest average value of this average value may be distinguished as a direction of a document.

[0027]In order to attain the 2nd purpose of the above, said compensation means according to claim 6 to 10 comprises a direction automatic correction device of a document according to claim 11 by on the whole rotating said inputted image data so that this image data may serve as those for Masakata and it may amend.

[0028]In order to attain the 2nd purpose of the above, said compensation means according to claim 6 to 10 comprises a direction automatic correction device of a document according to claim 12 by rotating only a character area per character area among said inputted image data so that each alphabetic data may serve as those for Masakata and it may amend.

[0029]In order to attain the 2nd purpose of the above, said compensation means according to claim 6 to 10 comprises a direction automatic correction device of a document according to claim 13 by reading in a form where alphabetic data is individually rotated among said inputted image data so that each alphabetic data may serve as those for Masakata and it may amend.

OPERATION

[Function]In the direction automatic discrimination device of a document according to claim 1, said discriminating means, The direction of a document (document image) is automatically distinguished with high precision by performing character recognition from two or more directions about the alphabetic data in the image data inputted by said image input hand with reference to said character recognition dictionary, and distinguishing the direction of a document based on this character recognition result.

[0031]In the direction automatic discrimination device of a document according to claim 2, said discriminating means according to claim 1, The same operation and effect as claim 1 are acquired by performing character recognition from two or more directions about the alphabetic data in said inputted image data with reference to said character recognition dictionary, and distinguishing the direction of character recognition concerning a character with the highest accuracy value of character recognition as a direction of a document.

[0032]In the direction automatic discrimination device of a document according to claim 3, said discriminating means according to claim 1, When said discriminating means performs character recognition from two or more directions, respectively about two or more alphabetic data in the character area which extracted the character area out of said inputted image data, and was extracted and distinguishes the direction of a document based on this character recognition result, the same operation and effect as claim 1 are acquired.

[0033]In the direction automatic discrimination device of a document according to claim 4, said discriminating means according to claim 1, Extract a character area out of said inputted image data, and character recognition is performed from two or more directions about two or more alphabetic data in the extracted character area, respectively, By distinguishing a direction with the largest average value according to the direction of the accuracy value of the character recognition of two or more characters as a direction of a document, the same operation and effect as claim 1 are acquired.

[0034]In the direction automatic discrimination device of a document according to claim 5, said discriminating means according to claim 1, Extract two or more character areas out of said inputted image data, and character recognition is performed from two or more directions, respectively about two or more alphabetic data in two or more extracted character areas, The same operation and effect as claim 1 are acquired by calculating the average value of the accuracy value of the character recognition according to the direction of two or more characters according to a character area, calculating the average value of the average value according to said direction in each character area further, and distinguishing a direction with the largest average value of this average value as a direction of a document.

[0035]In the direction automatic correction device of a document according to claim 6, said discriminating means, Character recognition is performed from two or more directions about the alphabetic data in the image data inputted by said image input hand with reference to said character recognition dictionary, Based on this character recognition result, distinguish the direction of a document, and said compensation means, When the direction of a document was not for Masakata and it is distinguished by said discriminating means, by amending so that the alphabetic data inputted by said image input means at least may serve as those for Masakata, the direction of a document (document image) is distinguished with high precision automatically, and is amended.

[0036]In the direction automatic correction device of a document according to claim 7, said discriminating means according to claim 6, The same operation and effect as claim 6 are acquired by performing character recognition from two or more directions about the alphabetic data in said inputted image data with reference to said character recognition dictionary, and distinguishing the direction of character recognition concerning a character with the highest accuracy value of character recognition as a direction of a document.

[0037]In the direction automatic correction device of a document according to claim 8, said discriminating means according to claim 6, The same operation and effect as claim 6 are acquired by extracting a character area out of said inputted image data, performing character recognition from two or more directions about two or more alphabetic data in the extracted character area, respectively, and distinguishing the direction of a document based on this character recognition result.

[0038]In the direction automatic correction device of a document according to claim 9, said discriminating means according to claim 6, Extract a character area out of said inputted image data, and character recognition is performed from two or more directions about two or more alphabetic data in the extracted character area, respectively, By distinguishing a direction with the largest average value according to the direction of the accuracy value of the character recognition of two or more characters as a direction of a document, the same operation and effect as claim 6 are acquired.

[0039]In the direction automatic correction device of a document according to claim 10. Said discriminating means according to claim 6 extracts two or more character areas out of said inputted image data, Character recognition is performed from two or more directions, respectively about two or more alphabetic data in two or more extracted character areas, The same operation and effect as claim 6 are acquired by calculating the average value of the accuracy value of the character recognition according to the direction of two or more characters according to a character area, calculating the average value of the average value according to said direction in each character area further, and distinguishing a direction with the largest average value of this average value as a direction of a document.

[0040]In the direction automatic correction device of a document according to claim 11, the same operation and effect as claim 6 are acquired by amending said compensation means according to claim 6 to 10 so that this image data may serve as those for Masakata by on the whole rotating said inputted image data.

[0041]In the direction automatic correction device of a document according to claim 12. The same operation and effect as claim 6 are acquired by amending said compensation means according to claim 6 to 10 so that each alphabetic data may serve as those for Masakata by rotating only a character area per character area among said inputted image data.

[0042]In the direction automatic correction device of a document according to claim 13. The same operation and effect as claim 6 are acquired by amending so that each alphabetic data may serve as those for Masakata by reading said compensation means according to claim 6 to 10 in the form where alphabetic data is individually rotated among said inputted image data.

EXAMPLE

[Example]Hereafter, the example of this invention is described, referring to drawings.

[0044]Drawing 1 is the direction automatic discrimination device of a document by the example of this invention, and the direction automatic correction device of a document a system configuration figure of the applied data processing system, and this system, It is the system which had the input part and image processing portion of a picture, and the intelligent input device or the independent input device was connected with the computer via I/F, and was made intelligent by a scanner device or copying machine.

[0045]The scanner part 1 is a means to read a document manuscript optically, to carry out photoelectric conversion, and to input as digital image data. If an autfeeder is attached to this scanner part 1, it is possible to carry out the continuation input of the manuscript of two or more sheets. CPU / memory part 2 performs various control, and since image data is saved temporarily, there is.

[0046]Character recognition / direction discrimination part 3 notes that the character expresses the direction of a document most correctly, Character recognition is performed for several kinds of character areas in a document from a direction (0 degree, 90 degrees, 180 degrees, and 270 degrees), and let the highest-precision direction be the direction of a document in the accuracy (the degree of confidence of character recognition: distance over the feature distribution of a character) of the character recognition in for these all directions.

[0047]The area separation section 4 is a block which performs processing which divides a character part, a figure section, a natural image area, the front part, etc. into a rectangular field, and adds the attributes (character part etc.) of each field from document image data as pretreatment for performing character recognition and direction discrimination processing by character recognition / direction discrimination part 3.

[0048]The memory storage 5 is constituted by a hard disk, magneto-optical disc, etc., and since various processing results (image data, an area separation result, a character recognition result, etc.) are saved, it is used, for example. The I/F part 6 is constituted by SCSI, RS232C, etc., and it is provided in order to transmit data to the exterior. OK, via the I/F part 6, from movable memory storage, such as a magneto-optical disc, the computer 7 obtains data and uses information. The printer section 8 carries out the printout of the image data etc. which were processed [various] based on area separation information and character recognition information to the image data inputted from the scanner part 1.

[0049]Next, the outline of the direction of document automatic distinction and amendment in this example, and character recognition processing is explained according to the flow chart of drawing 2.

[0050]The image data (a binary format image or a multi valued image) inputted by the scanner part 1 is first divided into a rectangular field by the area separation section 4 according to attributes, such as a character part, a figure section, a natural image area, and the front part (Step S1, S2). Here, the area information surrounded with the rectangle is created actually.

[0051]Next, the rectangle information on a character area is extracted from each attribute (Step S3). Here, character areas are a text part, a title part, a character in front, a caption part of a figure, etc. For example, in the case of the document of drawing 3 (a) and (c), the rectangle information on a character area as shown in drawing 3 (b) and (d), respectively is extracted. And document direction discrimination is performed using several blocks in these (step S4). As a result, if the direction of a document is for Masakata, character recognition processing will be succeedingly performed to the alphabetic block in a picture (Step S7).

[0052]On the other hand, if the direction of a document is the unjust direction, a right direction will be made to rotate image data (Step S5). And area separation is performed to a rotational image and the compensation process of area separation information is performed (Step S6). How for this to amend a difference of the area separation information accompanying image rotation, and to perform area separation processing again to all the rotational image data as one method. Another has the method of applying address translation to an area separation result. A result differs between the area separation processing which area separation processing performed in the early stage since the picture generally assumed those for Masakata, and the area separation processing performed to rotational image data in many cases. So, it is desirable to take the former method.

[0053]Next, it progresses to Step S7 and character recognition of the character area block in rotational image data is carried out by a character recognition processing system. As a result, area separation information and character recognition information are eventually acquired for a case with [both] rotation-less/rotation (Step S8).

[0054]This processing result is transmitted to the computer 7 via the I/F part 6, and is used with the application software of the filing on the computer 7, etc. In the system transmitted to the memory storage 5, picture information is inputted continuously, next it is used for the method used in batch processing of reading the information collectively. In the system furthermore transmitted to the printer 8, when the printer 8 has the function to interpret a Page Description Language, it is used for reconstructing a document by character recognition and processing of area separation by reverse PDL (how to create a Page Description Language from image data), or making a fair copy.

[0055]Next, the technique of document direction discrimination using character recognition processing is explained.

[0056][Area separation processing] The black pixel of document image data is detected and the rectangular frame of a black pixel block is created with border-line pursuit or a labeling method. Next, the black pixel density in the rectangle, the existence of a contiguity rectangular block, a rectangular horizontal-to-vertical ratio, etc. are made into a decision criterion, and character areas (a title, a duty, a caption, etc.), a graphic region, a natural drawing field, a table area, etc. are distinguished. The rectangle information on a character area is distinguished from this processing result.

[0057][Character recognition processing] The one methods of character recognition processing

include feature vector extraction and a comparison method. For example, as shown in drawing 4 (a), suppose that the character area containing the character "book" was distinguished. As the first step, character logging processing is performed about this character area (refer to drawing 4 (b)). This is the processing which starts the rectangle of one character, and if the state of black pixel continuity is detected, it will be called for. As a second stage story, a single character is started to the picture element block of $m \times n$ (for example, 64×64) (refer to drawing 4 (c)). And the distribution direction of a black pixel is extracted from the inside using a 3×3 -pixel window (direction-vector information: refer to drawing 4 (d)).

[0058]Drawing 4 (d) illustrates a part of direction vector information, shifts a 3×3 above-mentioned pixels window, and acquires tens of direction vector information. This vector information serves as the feature of a character. The contents of the character recognition dictionary beforehand remembered to be this feature vector are compared, and the feature extracts a character in an order from the nearest character to a feature vector. In this case, the feature becomes the 1st candidate of **, the 2nd candidate, the 2nd candidate, and -- in near turn at a feature vector. The nearness of the feature to this feature vector serves as a numerical value of the nearness of distance of confidence to that character, i.e., the degree of character recognition, (accuracy).

[0059][Character direction discrimination processing] Although it does in this way and the degree of confidence of character recognition is called for, the character direction discrimination processing based on the degree of confidence is explained using the example "the name of this invention" shown in drawing 5.

[0060]Drawing 5 (a) is a Masakata-oriented sentence and the sentence which 270 degrees of drawing 5 (b) rotated. If a "book" is observed here, when distinguishing a character direction, as shown in drawing 5 (c), character recognition is performed about one character "book" from four directions (0 degree, 90 degrees, 180 degrees, and 270 degrees). Each angle of rotation should just change how to read the field of character rectangles, and does not need to rotate a manuscript in particular.

[0061]The character recognition results in each angle of rotation differ mutually, as shown in drawing 5 (c). The temporary character recognition result and the degree of confidence for explanation are shown in drawing 5 (c).

It does not necessarily become this passage actually.

[0062]In drawing 5 (c), when character recognition is performed from for Masakata (0 degree), it is correctly recognized as a "book" and the degree of confidence also serves as 0.90 and a high value. When character recognition is performed from the direction rotated 90 degrees, erroneous recognition is carried out to a "town" and the degree of confidence also falls with 0.40. Thus, it is because that erroneous recognition occurs and the degree of confidence also falls performed character recognition based on the feature vector at the time of seeing from the rotated direction. Also when 180 degrees of character recognition are similarly performed from the direction rotated 270 degrees, erroneous recognition occurs and the degree of confidence also falls. If the degree of confidence according to the direction of character recognition is a complicated character, in a certain degree, the difference will appear notably.

[0063]In a Masakata-oriented case, since the degree of confidence is high No. 1, the result of drawing 5 (c) is judged that a possibility of a document that it is suitable for Masakata is high. In order to raise the accuracy of character direction distinction, character recognition is similarly performed from four directions about two or more characters within the same block. Since there

is a possibility of carrying out incorrect pine ***** of the character direction about a special character string when a character direction is distinguished only with one block, character recognition same about two or more blocks is performed.

[0064]And about each block, the average value of the degree of confidence according to the 4 directions of each recognition object character within the block concerned is calculated, further, the average value over the average value of the degree of confidence according to the 4 directions in each block is calculated, and a direction with this highest average value is authorized as a character direction (the direction of a document).

[0065]Thus, it becomes possible by [within the same block] authorizing the character direction of two or more characters further with the degree of confidence of two or more characters within the same block to distinguish the direction of a character (document) with high precision, without authorizing a character direction with the degree of confidence of only one character. However, even if a character direction is distinguished with the degree of confidence of only one character or it distinguishes a character direction with the degree of confidence of two or more characters within the same block, it cannot be overemphasized that a character direction can be distinguished from the former with high precision.

[0066]Next, when the discriminated result of a character direction (the direction of a document) is the direction of [other than for Masakata], an original image is rotated so that a character direction may become for Masakata. It is possible to perform this rotation simply by publicly known art using CPU / memory 2 of drawing 1, and that explanation is omitted.

[0067]The original image data shown in drawing 6 (a), the area separation data shown in drawing 6 (b), and the character recognition information shown in drawing 6 (c) can be acquired by the above processings. These information is used by applications, such as electronic filing, document plastic surgery, and DTP, as mentioned above.

[0068]"header" which shows that it is area separation data as the form of area separation data was shown in drawing 6 (b), The information on each field (block) which was constituted by identifier [of the separated field] "rect1" - "rectn4", and was distinguished by this identifier, The number "order" of a block, the attribute (a character part, a figure section, etc.) of a block "att", The coordinate value at the upper left of a block "x1" and "y1", the width "w" of a block, The height "h" of a block, vertical writing, or "direction" that shows lateral writing, It is constituted by the attribute "upperAtt" of "SelfID" which is ID of the block concerned, "upperID" which is ID of the parent block which includes the block concerned, and a parent block, and the reserve area "reserve."

[0069]The character recognition information "OCR1" have "header" which shows that it is character recognition information as character recognition information was shown in drawing 6 (c), for example, concerning single characters, such as a "book", etc., It is constituted by the combination information on "blk header" equivalent to the above-mentioned rect1 grade which shows the block with which the character concerned is contained.

[0070]And each character recognition information, such as "OCR1", The 1st according to "type" and the degree of confidence of the above-mentioned character recognition which show whether it is a character or it is blank - 5th candidates-characters "character 1" - "character 5", It is constituted by the logging position "x1" of the character concerned and "y1", the width of character "w" concerned, the height of character "h" concerned, and the reserve area "reserve."

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is a system configuration figure of the data processing system which applied the direction automatic discrimination device of a document and the direction automatic correction device of a document by the example of this invention.

[Drawing 2] It is a flow chart which shows the direction of document automatic distinction and amendment by the example of this invention, and character recognition processing.

[Drawing 3] It is a figure showing an area separation state.

[Drawing 4] It is an explanatory view for explaining the processing process of character recognition processing.

[Drawing 5] It is an explanatory view for explaining document (character) direction discrimination processing.

[Drawing 6] It is a figure showing area separation and the data format of character recognition information.

[Drawing 7] It is an explanatory view for describing other examples.

[Drawing 8] Drawing 7 is an explanatory view for describing other different examples.

[Drawing 9] It is a flow chart which shows the direction of document automatic distinction and amendment concerning other examples of drawing 8, and character recognition processing.

[Drawing 10] It is the figure which illustrated the character recognition result according to direction over the same character.

[Drawing 11] It is the figure which illustrated the form of the character direction of various documents, etc.

[Drawing 12] It is an explanatory view of a ***** sake about the problem at the time of carrying out the monitor display of the document.

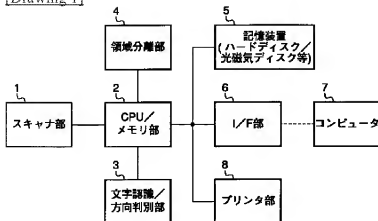
[Drawing 13] It is an explanatory view for explaining the conventional document direction discrimination technique.

[Description of Notations]

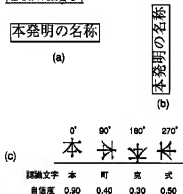
- 1 -- Scanner part
- 2 -- CPU/memory part
- 3 -- Character recognition/direction discrimination part
- 4 -- Area separation section
- 5 -- Memory storage
- 6 -- I/F part
- 7 -- Computer
- 8 -- Printer section

DRAWINGS

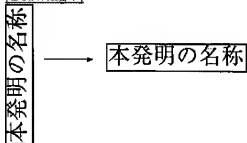
[Drawing 1]



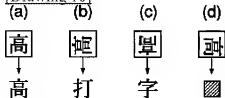
[Drawing 5]



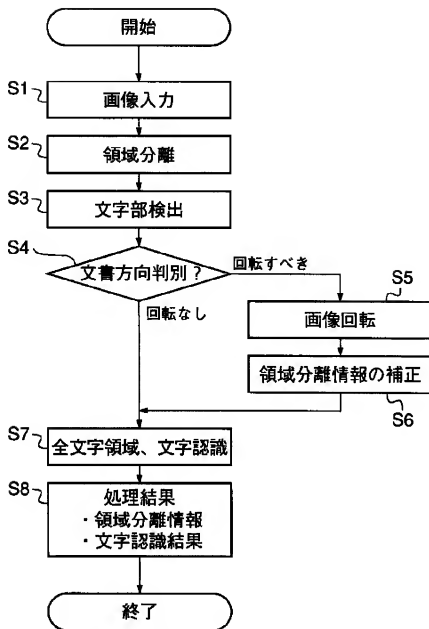
[Drawing 7]



[Drawing 10]



[Drawing 2]



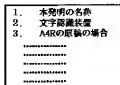
[Drawing 3]



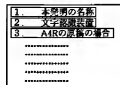
(a)



(b)

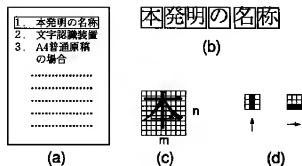


(c)

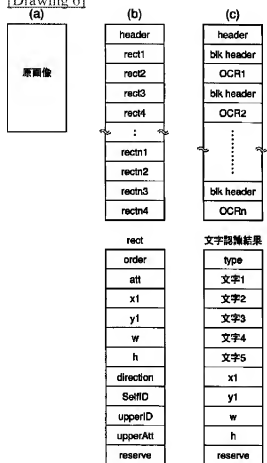


(d)

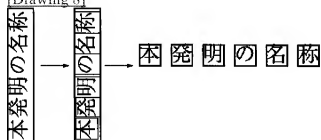
[Drawing 4]



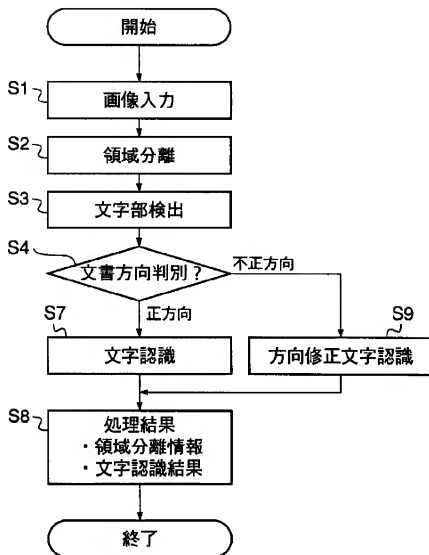
[Drawing 6]



[Drawing 8]



[Drawing 11]



[Drawing 12]

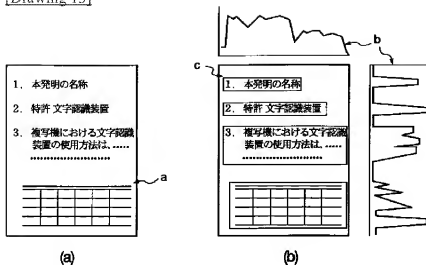


(a)



(b)

[Drawing 13]



* NOTICES *

JPO and INPIT are not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3. In the drawings, any words are not translated.

CORRECTION OR AMENDMENT

[Kind of official gazette] Printing of amendment by regulation of 2 of Article 17 of Patent Law
 [Section classification] The 3rd classification of the part VI gate
 [Publication date] April 26, Heisei 14 (2002.4.26)

[Publication No.] JP, 8-212298, A
 [Date of Publication] August 20, Heisei 8 (1996.8.20)
 [Annual volume number] Publication of patent applications 8-2123
 [Application number] Japanese Patent Application No. 7-36079
 [The 7th edition of International Patent Classification]
 G06K 9/46

9/03

[FI]
 G06K 9/46 A

9/03 C

[Written amendment]

[Filing date]January 28, Heisei 14 (2002.1.28)

[Amendment 1]

[Document to be Amended]Specification

[Item(s) to be Amended]The name of an invention

[Method of Amendment]Change

[Proposed Amendment]

[Title of the Invention]A document processing device and a document processing method

[Amendment 2]

[Document to be Amended]Specification

[Item(s) to be Amended]Claim

[Method of Amendment]Change

[Proposed Amendment]

[Claim(s)]

[Claim 1]A character recognition dictionary used for character recognition,

A discriminating means which performs character recognition processing from two or more directions about alphabetic data in inputted document image data with reference to this character recognition dictionary, and distinguishes the direction of a document of this document image based on a result of this character recognition processing,

A document processing device characterized by preparation *****

[Claim 2]The document processing device according to claim 1, wherein said discriminating means distinguishes a direction to which an accuracy value of character recognition became the highest as a direction of a document of this document image from a result of each character recognition processing from said two or more directions.

[Claim 3]Said discriminating means extracts a character area out of said inputted document image data, The document processing device according to claim 1 performing character recognition processing from two or more directions, respectively about two or more alphabetic data in an extracted this character area, and distinguishing the direction of a document of this document image based on a character recognition processing result of a character of this plurality.

[Claim 4]Said discriminating means extracts a character area out of said inputted document image data, The document processing device according to claim 3 performing character recognition processing from two or more directions, respectively about two or more alphabetic data in an extracted this character area, and distinguishing a direction with the largest average value according to the direction of an accuracy value as a direction of a document of this document image based on a character recognition processing result of a character of this plurality.

[Claim 5]As opposed to two or more character areas of each which said discriminating means extracted two or more character areas out of said inputted image data, and were this extracted, Character recognition processing is performed from two or more directions about two or more alphabetic data, respectively, The document processing device according to claim 1 calculating average value according to direction of a character-recognition-precision value according to a character area, asking for an average of average value according to direction calculated in said each character area further, and distinguishing a direction with the largest average of this average value according to direction as a direction of a document.

[Claim 6]The document processing device according to claim 1 provided with a compensation means amended so that the direction of alphabetic data used for distinction by said discriminating means at least may turn into those for Masakata, when the direction of a document of this document image was not for Masakata and it is distinguished by said discriminating means.

[Claim 7]The document processing device according to claim 6 amending said compensation means so that this document image data may serve as those for Masakata by on the whole rotating said inputted document image data.

[Claim 8]The document processing device according to claim 6 amending said compensation means so that each alphabetic data may serve as those for Masakata by rotating only a character area per character area among said inputted document image data.

[Claim 9]The document processing device according to claim 6 amending said compensation means so that each alphabetic data may serve as those for Masakata by reading in a form where alphabetic data is individually rotated among said inputted document image data.

[Claim 10]The document processing device according to claim 6 provided with a character recognition processing means which performs character recognition processing to alphabetic data amended by said compensation means.

[Claim 11]The document processing device according to claim 1, wherein character recognition processing in said discriminating means is performed using a feature vector of a character stored in said character recognition dictionary, and a feature vector of alphabetic data obtained from this inputted document image data.

[Claim 12]A document processing method having a discriminating step which performs character recognition processing from two or more directions about alphabetic data in inputted document image data with reference to a character recognition dictionary, and distinguishes the direction of a document of this document image based on a result of this character recognition processing.

[Claim 13]The document processing method according to claim 12 provided with a correction step amended so that the direction of alphabetic data used for distinction by said discriminating means at least may turn into those for Masakata, when the direction of a document of this document image was not for Masakata in said discriminating step and it is distinguished.

[The amendment 3]

[Document to be Amended]Specification

[Item(s) to be Amended]0001

[Method of Amendment]Change

[Proposed Amendment]

[0001]

[Industrial Application]This invention relates to the document processing device which distinguishes automatically the direction of the document (document image) read by optoelectric transducers, such as CCD, and a document processing method.

[Amendment 4]

[Document to be Amended]Specification

[Item(s) to be Amended]0015

[Method of Amendment]Change

[Proposed Amendment]

[0015]This invention was made under such a background and the 1st purpose is enabling it to distinguish the direction of a document (document image) with high precision automatically.

[Amendment 5]

[Document to be Amended]Specification

[Item(s) to be Amended]0016

[Method of Amendment]Change

[Proposed Amendment]

[0016]The 2nd purpose of this invention is distinguishing the direction of a document (document image) with high precision automatically, and enabling it to amend it.

[Amendment 6]

[Document to be Amended]Specification

[Item(s) to be Amended]0017

[Method of Amendment]Change

[Proposed Amendment]

[0017]

[Means for Solving the Problem]In order to attain the 1st purpose of the above, the document processing device according to claim 1, With reference to a character recognition dictionary used for character recognition, and this character recognition dictionary, character recognition processing was performed from two or more directions about alphabetic data in inputted document image data, and it has a discriminating means which distinguishes the direction of a document of this document image based on a result of this character recognition processing.

[Amendment 7]

[Document to be Amended]Specification

[Item(s) to be Amended]0018

[Method of Amendment]Change

[Proposed Amendment]

[0018]In order to attain the 1st purpose of the above, said discriminating means according to claim 1 comprises a document processing device according to claim 2 so that the accuracy value of character recognition may distinguish the direction which became the highest as a direction of a document of this document image from the result of each character recognition processing from said two or more directions.

[Amendment 8]

[Document to be Amended]Specification

[Item(s) to be Amended]0019

[Method of Amendment]Change

[Proposed Amendment]

[0019]In order to attain the 1st purpose of the above, in the document processing device according to claim 3. Said discriminating means according to claim 1 extracts a character area out of said inputted document image data, Character recognition processing is performed from two or more directions, respectively about two or more alphabetic data in the extracted this character area, and it is constituted so that the direction of a document of this document image may be distinguished based on the character recognition processing result of the character of this plurality.

[Amendment 9]

[Document to be Amended]Specification

[Item(s) to be Amended]0020

[Method of Amendment]Change

[Proposed Amendment]

[0020]In order to attain the 1st purpose of the above, in the document processing device according to claim 4, Said discriminating means according to claim 3 extracts a character area out of said inputted document image data, Character recognition processing is performed from two or more directions, respectively about two or more alphabetic data in the extracted this character area, and it is constituted so that a direction with the largest average value according to the direction of an accuracy value may be distinguished as a direction of a document of this document image based on the character recognition processing result of the character of this plurality.

[Amendment 10]

[Document to be Amended]Specification

[Item(s) to be Amended]0021

[Method of Amendment]Change

[Proposed Amendment]

[0021]In order to attain the 1st purpose of the above, in the document processing device according to claim 5. As opposed to two or more character areas of each which said discriminating means according to claim 1 extracted two or more character areas out of said inputted image data, and were this extracted, Character recognition processing is performed from two or more directions about two or more alphabetic data, respectively, the average value according to direction of a character-recognition-precision value is calculated according to a character area, and it asks for the average of the average value according to direction calculated in said each character area further, and it is constituted so that a direction with the largest average of this average value according to direction may be distinguished as a direction of a document.

[Amendment 11]

[Document to be Amended]Specification

[Item(s) to be Amended]0022

[Method of Amendment]Change

[Proposed Amendment]

[0022]In order to attain the 2nd purpose of the above, the document processing device according to claim 6, When the direction of a document of the document image was not for Masakata and it is distinguished by said discriminating means according to claim 1, it has the compensation means amended so that the direction of the alphabetic data used for distinction by said discriminating means at least may turn into those for Masakata.

[Amendment 12]

[Document to be Amended]Specification

[Item(s) to be Amended]0023

[Method of Amendment]Change

[Proposed Amendment]

[0023]In order to attain the 2nd purpose of the above, with the document processing device according to claim 7, said compensation means according to claim 6 is amended by on the whole rotating said inputted document image data so that this document image data may serve as those for Masakata.

[Amendment 13]

[Document to be Amended]Specification

[Item(s) to be Amended]0024

[Method of Amendment]Change

[Proposed Amendment]

[0024]In order to attain the 2nd purpose of the above, said compensation means according to claim 6 comprises a document processing device according to claim 8 by rotating only a character area per character area among said inputted document image data so that each alphabetic data may serve as those for Masakata and it may amend.

[Amendment 14]

[Document to be Amended]Specification

[Item(s) to be Amended]0025

[Method of Amendment]Change

[Proposed Amendment]

[0025]In order to attain the 2nd purpose of the above, said compensation means according to claim 6 comprises a document processing device according to claim 9 by reading in the form where alphabetic data is individually rotated among said inputted document image data so that each alphabetic data may serve as those for Masakata and it may amend.

[Amendment 15]

[Document to be Amended]Specification

[Item(s) to be Amended]0026

[Method of Amendment]Change

[Proposed Amendment]

[0026]In order to attain the 2nd purpose of the above, in the document processing device according to claim 10, it has the character recognition processing means which performs character recognition processing further to the alphabetic data amended by said compensation means according to claim 6.

[Amendment 16]

[Document to be Amended]Specification

[Item(s) to be Amended]0027

[Method of Amendment]Change

[Proposed Amendment]

[0027]In order to attain the 1st purpose of the above, in the document processing device according to claim 11. The character recognition processing in said discriminating means according to claim 1 is constituted so that it may be carried out using the feature vector of the character stored in said character recognition dictionary, and the feature vector of the alphabetic data obtained from the this inputted document image data.

[Amendment 17]

[Document to be Amended]Specification

[Item(s) to be Amended]0028

[Method of Amendment]Change

[Proposed Amendment]

[0028]In order to attain the 1st purpose of the above, the document processing method according to claim 12, With reference to a character recognition dictionary, character recognition processing is performed from two or more directions about the alphabetic data in the inputted document image data, and it has a discriminating step which distinguishes the direction of a document of this document image based on the result of this character recognition processing.

[Amendment 18]

[Document to be Amended]Specification

[Item(s) to be Amended]0029

[Method of Amendment]Change

[Proposed Amendment]

[0029]In order to attain the 2nd purpose of the above, the document processing method according to claim 13, When the direction of a document of this document image was not for Masakata in said discriminating step according to claim 12 and it is distinguished, it has the correction step amended so that the direction of the alphabetic data used for distinction by said discriminating means at least may turn into those for Masakata.

[Amendment 19]

[Document to be Amended]Specification

[Item(s) to be Amended]0030

[Method of Amendment]Change

[Proposed Amendment]

[0030]

[Function]In the document processing device according to claim 1, said discriminating means, With reference to the character recognition dictionary used for character recognition, and this character recognition dictionary, character recognition processing is performed from two or more directions about the alphabetic data in the inputted document image data. By distinguishing the direction of a document of this document image based on the result of this character recognition processing, the direction of a document (document image) is distinguished with high precision automatically.

[Amendment 20]

[Document to be Amended]Specification

[Item(s) to be Amended]0031

[Method of Amendment]Change

[Proposed Amendment]

[0031]In the document processing device according to claim 2, when said discriminating means according to claim 1 distinguishes the direction to which the accuracy value of character recognition became the highest as a direction of a document of this document image from the result of each character recognition processing from said two or more directions, the same operation and effect as claim 1 are acquired.

[Amendment 21]

[Document to be Amended]Specification

[Item(s) to be Amended]0032

[Method of Amendment]Change

[Proposed Amendment]

[0032]In the document processing device according to claim 3, said discriminating means according to claim 1, Extract a character area out of said inputted document image data, and character recognition processing is performed from two or more directions, respectively about two or more alphabetic data in the this extracted character area. By distinguishing the direction of a document of this document image based on the character recognition processing result of the character of this plurality, the same operation and effect as claim 1 are acquired.

[Amendment 22]

[Document to be Amended]Specification

[Item(s) to be Amended]0033

[Method of Amendment]Change

[Proposed Amendment]

[0033]In the document processing device according to claim 4, said discriminating means

according to claim 3, Extract a character area out of said inputted document image data, and character recognition processing is performed from two or more directions, respectively about two or more alphabetic data in the this extracted character area, The same operation and effect as claim 1 are acquired by distinguishing a direction with the largest average value according to the direction of an accuracy value as a direction of a document of this document image based on the character recognition processing result of the character of this plurality.

[Amendment 23]

[Document to be Amended]Specification

[Item(s) to be Amended]0034

[Method of Amendment]Change

[Proposed Amendment]

[0034]In the document processing device according to claim 5, said discriminating means according to claim 1, As opposed to two or more character areas of each which extracted two or more character areas out of said inputted image data, and were this extracted, Character recognition processing is performed from two or more directions about two or more alphabetic data, respectively, The same operation and effect as claim 1 are acquired by calculating the average value according to direction of a character-recognition-precision value according to a character area, asking for the average of the average value according to direction calculated in said each character area further, and distinguishing a direction with the largest average of this average value according to direction as a direction of a document.

[Amendment 24]

[Document to be Amended]Specification

[Item(s) to be Amended]0035

[Method of Amendment]Change

[Proposed Amendment]

[0035]In the document processing device according to claim 6, said compensation means, When the direction of a document of the document image was not for Masakata and it is distinguished by said discriminating means according to claim 1, by amending so that the direction of the alphabetic data used for distinction by said discriminating means at least may turn into those for Masakata, the direction of a document (document image) is distinguished with high precision automatically, and is amended.

[Amendment 25]

[Document to be Amended]Specification

[Item(s) to be Amended]0036

[Method of Amendment]Change

[Proposed Amendment]

[0036]In the document processing device according to claim 7, when said compensation means according to claim 6, on the whole, rotates said inputted document image data, the same operation and effect as claim 6 are acquired by amending so that this document image data may serve as those for Masakata.

[Amendment 26]

[Document to be Amended]Specification

[Item(s) to be Amended]0037

[Method of Amendment]Change

[Proposed Amendment]

[0037]In the document processing device according to claim 8, the same operation and effect as

claim 6 are acquired by amending said compensation means according to claim 6 so that each alphabetic data may serve as those for Masakata by rotating only a character area per character area among said inputted document image data.

[Amendment 27]

[Document to be Amended]Specification

[Item(s) to be Amended]0038

[Method of Amendment]Change

[Proposed Amendment]

[0038]In the document processing device according to claim 9, said compensation means according to claim 6 is constituted so that each alphabetic data may serve as those for Masakata by reading in the form where alphabetic data is individually rotated among said inputted document image data and it may amend, and the same operation and effect as claim 6 are acquired.

[Amendment 28]

[Document to be Amended]Specification

[Item(s) to be Amended]0039

[Method of Amendment]Change

[Proposed Amendment]

[0039]In the document processing device according to claim 10, the same operation and effect as claim 6 are acquired by having a character recognition processing means which performs character recognition processing further to the alphabetic data amended by said compensation means according to claim 6.

[Amendment 29]

[Document to be Amended]Specification

[Item(s) to be Amended]0040

[Method of Amendment]Change

[Proposed Amendment]

[0040]In the document processing device according to claim 11, the character recognition processing in said discriminating means according to claim 1, It is constituted so that it may be carried out using the feature vector of the character stored in said character recognition dictionary, and the feature vector of the alphabetic data obtained from the this inputted document image data, and the same operation and effect as claim 1 are acquired.

[Amendment 30]

[Document to be Amended]Specification

[Item(s) to be Amended]0041

[Method of Amendment]Change

[Proposed Amendment]

[0041]The document processing method according to claim 12 performs character recognition processing from two or more directions about the alphabetic data in the inputted document image data with reference to a character recognition dictionary, It has a discriminating step which distinguishes the direction of a document of this document image based on the result of this character recognition processing, and the same operation and effect as claim 1 are acquired.

[Amendment 31]

[Document to be Amended]Specification

[Item(s) to be Amended]0042

[Method of Amendment]Change

[Proposed Amendment]

[0042]When the direction of a document of this document image was not for Masakata in said discriminating step according to claim 12 and the document processing method according to claim 13 is distinguished further, It has a correction step amended so that the direction of the alphabetic data used for distinction by said discriminating means at least may turn into those for Masakata, and the same operation and effect as claim 6 are acquired.

[Translation done.]

Your Ref: 07844-249JP1
Our Ref: PA941

**Translation of Selected Portions of
Pat. Laid-open Official Gazette**

Appln. No: 7-36079
Appln. Date: February 1, 1995
Laid-open Pub. No: 8-212298
Laid-open Pub. Date: August 20, 1996

Inventor(s): Makoto Takaoka
Applicant(s): Canon K.K.
Attorney(s): Toshihiko Watanabe

1. Title of the Invention

DOCUMENT DIRECTION AUTOMATIC DISCRIMINATING APPARATUS
AND A DOCUMENT DIRECTION AUTOMATIC CORRECTING APPARATUS

2. Claims

(omitted)

3. Detailed Description of the Invention (Selected Portions)

1)

(omitted)

(19) 日本国特許庁 (J P)

(12) 公開特許公報 (A)

(11) 特許出願公開番号

特開平8-212298

(43) 公開日 平成8年(1996)8月20日

(51) Int.Cl.⁴

識別記号

片内整理番号

F I

技術表示箇所

G 0 6 K 9/46

A 9061-5H

9/03

C 9061-5H

審査請求 未請求 請求項の数13 F D (全 12 頁)

(21) 出願番号

特願平7-36079

(22) 出願日

平成7年(1995)2月1日

(71) 出願人

000001007

キヤノン株式会社

東京都大田区下丸子3丁目30番2号

(72) 発明者

高岡 真平

東京都大田区下丸子3丁目30番2号 キヤ

ノン株式会社内

(74) 代理人

弁理士 渡部 敏彦

(54) 【発明の名称】 文書方向自動判別装置、及び文書方向自動補正装置

(57) 【要約】

【目的】 文書（文書画像）の方向を自動的に高精度に判別して、補正できるようにする。

【構成】 文書の方向を一番正確に現しているのは文字であることに着目して、入力された文書画像データに対して、複数の文字領域中の複数の文字について、それぞれ0°、90°、180°、270°の4方向から文字認識を行い、文字領域別に複数の文字の方向別の文字認識の精度値の（自信度）の平均値を求め、さらに各文字領域における前記方向別の平均値の平均値を求め、この平均値の平均値が最も大きい方向を文書方向として判別し、判別した文書方向が正方向でない場合は、文書画像データを回転させて正方向となるようにする。

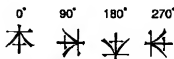
本発明の名称

(a)

本発明の名称

(b)

(c)



認識文字	本	町	克	式
自信度	0.90	0.40	0.30	0.50

【特許請求の範囲】

【請求項1】 光学的に読取られた文書情報を光電変換して画像データとして入力する画像入力手段と、文字の特徴を記載した文字認識辞書と、該文字認識辞書を参照して前記画像入力手段により入力された画像データ中の文字データについて複数の方向から文字認識を行い、該文字認識結果に基づいて文書方向を判別する判別手段と、

を備えたことを特徴とする文書方向自動補正装置。

【請求項2】 前記判別手段は、前記文字認識辞書を参照して前記入力された画像データ中の文字データについて複数の方向から文字認識を行い、文字認識の精度値が最も高い文字に係る文字認識方向を文書方向として判別することを特徴とする請求項1記載の文書方向自動補正装置。

【請求項3】 前記判別手段は、前記入力された画像データの中から文字領域を抽出し、抽出した文字領域中の複数の文字データについて夫々複数の方向から文字認識を行い、該文字認識結果に基づいて文書方向を判別することを特徴とする請求項1記載の文書方向自動補正装置。

【請求項4】 前記判別手段は、前記入力された画像データの中から文字領域を抽出し、抽出した文字領域中の複数の文字データについて夫々複数の方向から文字認識を行い、複数の文字の文字認識の精度値の方向別の平均値が最も大きい方向を文書方向として判別することを特徴とする請求項1記載の文書方向自動補正装置。

【請求項5】 前記判別手段は、前記入力された画像データの中から複数の文字領域を抽出し、抽出した複数の文字領域中の複数の文字データについて夫々複数の方向から文字認識を行い、文字領域別に複数の文字の方向別の文字認識の精度値の平均値を求め、さらに各文字領域における前記方向別の平均値の平均値を求め、該平均値の平均値が最も大きい方向を文書方向として判別することを特徴とする請求項1記載の文書方向自動補正装置。

【請求項6】 光学的に読取られた文書情報を光電変換して画像データとして入力する画像入力手段と、文字の特徴を記載した文字認識辞書と、該文字認識辞書を参照して前記画像入力手段により入力された画像データ中の文字データについて複数の方向から文字認識を行い、該文字認識結果に基づいて文書方向を判別する判別手段と、

該判別手段により文書方向が正方向でないと判別された場合、少なくとも前記画像入力手段により入力された文字データが正方向となるように補正する補正手段と、を備えたことを特徴とする文書方向自動補正装置。

【請求項7】 前記判別手段は、前記文字認識辞書を参照して前記入力された画像データ中の文字データについて複数の方向から文字認識を行い、文字認識の精度値が最も高い文字に係る文字認識方向を文書方向として判別

することを特徴とする請求項6記載の文書方向自動補正装置。

【請求項8】 前記判別手段は、前記入力された画像データの中から文字領域を抽出し、抽出した文字領域中の複数の文字データについて夫々複数の方向から文字認識を行い、該文字認識結果に基づいて文書方向を判別することを特徴とする請求項6記載の文書方向自動補正装置。

【請求項9】 前記判別手段は、前記入力された画像データの中から文字領域を抽出し、抽出した文字領域中の複数の文字データについて夫々複数の方向から文字認識を行い、複数の文字の文字認識の精度値の方向別の平均値が最も大きい方向を文書方向として判別することを特徴とする請求項6記載の文書方向自動補正装置。

【請求項10】 前記判別手段は、前記入力された画像データの中から複数の文字領域を抽出し、抽出した複数の文字領域中の複数の文字データについて夫々複数の方向から文字認識を行い、文字領域別に複数の文字の方向別の文字認識の精度値の平均値を求め、さらに各文字領域における前記方向別の平均値の平均値を求め、該平均値の平均値が最も大きい方向を文書方向として判別することを特徴とする請求項6記載の文書方向自動補正装置。

【請求項11】 前記補正手段は、前記入力された画像データを全体的に回転することを特徴とする請求項6～10記載の文書方向自動補正装置。

【請求項12】 前記補正手段は、前記入力された画像データのうち文字領域だけを文字領域単位で回転することにより各文字データが正方向となるように補正することを特徴とする請求項6～10記載の文書方向自動補正装置。

【請求項13】 前記補正手段は、前記入力された画像データのうち文字データを個別に回転する形で読出することにより各文字データが正方向となるように補正することを特徴とする請求項6～10記載の文書方向自動補正装置。

【発明の詳細な説明】

【0001】

【産業上の利用分野】本発明は、CCD等の光電変換素子により読取られた文書（文書画像）の方向を自動的に判別する文書画像方向自動判別装置、及び文書（文書画像）方向を自動的に補正する文書方向自動補正装置に関する。

【0002】

【従来の技術】従来、情報処理装置では、一般に、スキャナなどの光学的読取装置により読取られた原稿情報（画像データ）の中から文字を認識することが行われているが、文字認識は、あくまでも文字が正方向を向いている場合の特徴から文字候補を選び出さるため、画

像データが90°、180°等で回転されて読取られた場合は、文字認識を正しく行うことができず、全く異なる文字コードが出力されていく。

【0003】例えば、図10に示した「高」という文字の場合、図10(a)のように文字が正方向を向いているときは、正しく「高」と認識するが、図10(b)のように270°回転で「打」と誤認識し、図10(c)のように180°回転で「字」と誤認識し、図10

(d)のように90°回転で認識不可能となってしまう(なお、この認識結果は、あくまで説明の便宜上のものであり、実際の結果とは異なる)。

【0004】そこで、正しく文字認識を行うために、文書の方向が正しくない場合、原稿の方向を人手により直して、再度、原稿読取り、文字認識を行っていた。

【0005】しかしながら、スキヤナの処理スピードが向上し、オートフィードと呼ばれる原稿自動給紙機能が附属され始めてから、大量の原稿を処理することが増えてきて、人手によりいちいち原稿の方向を補正することが困難になってきた。

【0006】また、原稿上の文書内容は、縦書き、横書き等の各種のパターンで表現される。すなわち、A4縦置きで横書きの文書(図11(a)参照：日本語の横書き文書や英語の文書等よく用いられる)、A4横置きで横書きの文書(図11(b)参照：センテンスが長いおみやげ、OHP用の文書、A3、B4などの文書を縮小コピーした場合などでよく用いられる)、A4横置きで真中で段組が切替わった横書きの文書(図11(c)参照：A4文書を2枚を連続して縮小コピーした場合に良く用いられる)、A4縦置きで縦書きの文書(図11(d)参照)等の各種のパターンがある。

【0007】一方、モニタに表示される画像の方向は、画像入力する際のスキヤナの走査方向(画像読取方向)により決まってしまう。このため、スキヤナの走査方向と文書の文字列の方向とが一致するような姿勢で原稿を読取った場合は、図12(a)に示したように、文書が本来の姿勢で表示される。

【0008】しかし、A4のスキヤナの場合は、原稿の方向は一義的に決められているため、スキヤナの走査方向と文書の文字列の方向とを一致させた姿勢で原稿を読取ることができず、例えば図12(b)に示したように、文書が本来の姿勢から90°回転された状態で表示され、非常に読み難くなる場合があった。

【0009】上記のような文字の誤認識やモニタ上での読み難さを解消するため、従来、文書画像方向自動判別/回転機能を備えた情報処理装置が実現されている。

【0010】従来、文書画像方向自動判別手法の代表的なものとして、図13に示したように、領域分離結果に基づいて表のような線のある部分の方向性を見て、横方向に長い線で文字領域を分割している方向を(図13(a)の“a”参照)、その文書画像の方向として判別する方

式、文書の縦方向と横方向の射影(ヒストグラム)を検出して、その区別具合を見て判断したり(図13

(b)の“b”参照)、領域を分離して文字領域の特徴にマッチした矩形領域の横長、縦長といった特徴(図13(b)の“c”参照)から判別していた。

【0011】そして、これらの手法により判別した文書画像方向に基づいて、文書画像データを回転処理し、その回転された画像に対して文字認識処理を行っていた。このような文書方向に基づく正しい文字認識への期待は、近年大量の文書を整理したいというため、電子ファインリングなどの応用やDTPの発展、複写機等の大量に文書を処理する機器の発展と共に非常に高まってきた。

【0012】

【発明が解決しようとする課題】しかし、従来の文書方向判別方式は、方向判別の精度が低かった。すなわち、文書中の表の線を用いる判別方式の場合は、表の線がない文書や縦横混在する線を含んだ文書の場合は、方向判別を誤る可能性があった。

【0013】また、縦横の斜射影を検出する方式の場合は、文字のみで方や段落がはっきり分かれている文書では、比較的精度は高いが、文書中に図や自然画が含まれている文書の場合は、方向判別を誤る可能性があった。

【0014】さらに、表の線を用いる方式、縦横の斜射影を検出する方式、文字領域の横長、縦長の特徴に基づく方式のいずれにおいても、0°と180°の回転、90°と180°の回転等を区別することは困難であり、方向判別の精度は低かった。

【0015】本発明は、このような背景の下になされたもので、その第1の目的は、文書(文書画像)の方向を自動的に高精度に判別し得る文書方向自動判別装置を提供することにある。

【0016】本発明の第2の目的は、文書(文書画像)の方向を自動的に高精度に判別して補正し得る文書方向自動補正装置を提供することにある。

【0017】

【課題を解決するための手段】上記第1の目的を達成するため、請求項1記載の文書方向自動判別装置は、光学的に読取られた文書情報を光電変換して画像データとして入力する画像入力手段と、文字の特徴を記載した文字認識辞書と、該文字認識辞書を参照して前記画像入力手段により入力された画像データ中の文字データについて複数の方向から文字認識を行い、該文字認識結果に基づいて文書方向を判別する判別手段とを備えている。

【0018】上記第1の目的を達成するため、請求項2記載の文書方向自動判別装置では、請求項1記載の前記判別手段は、前記文字認識辞書を参照して前記入力された画像データ中の文字データについて複数の方向から文字認識を行い、文字認識の精度度が最も高い文字に係る文字認識方向を文書方向として判別するように構成されている。

【0019】上記第1の目的を達成するため、請求項3記載の文書方向自動判別装置では、請求項1記載の前記判別手段は、前記判別手段は、前記入力された画像データの中から文字領域を抽出し、抽出した文字領域中の複数の文字データについて夫々複数の方向から文字認識を行い、該文字認識結果に基づいて文書方向を判別するように構成されている。

【0020】上記第1の目的を達成するため、請求項4記載の文書方向自動判別装置では、請求項1記載の前記判別手段は、前記入力された画像データの中から文字領域を抽出し、抽出した文字領域中の複数の文字データについて夫々複数の方向から文字認識を行い、複数の文字の文字認識の精度値の方向別の平均値が最も大きい方向を文書方向として判別するように構成されている。

【0021】上記第1の目的を達成するため、請求項5記載の文書方向自動判別装置では、請求項1記載の前記判別手段は、前記入力された画像データの中から複数の文字領域を抽出し、抽出した複数の文字領域中の複数の文字データについて夫々複数の方向から文字認識を行い、文字領域別に複数の文字の方向別の文字認識の精度値の平均値を求め、さらに各文字領域における前記方向別の平均値の平均値を求め、該平均値の平均値が最も大きい方向を文書方向として判別するように構成されている。

【0022】上記第2の目的を達成するため、請求項6記載の文書方向自動補正装置は、光学的に読取られた文書情報を光電変換して画像データとして入力する画像入力手段と、文字の特徴を記載した文字認識辞書と、該文字認識辞書を参照して前記画像入力手段により入力された画像データ中の文字データについて複数の方向から文字認識を行い、該文字認識結果に基づいて文書方向を判別する判別手段と、該判別手段により文書方向が正方向でないと判別された場合、少なくとも前記画像入力手段により入力された文字データが正方向となるように補正する補正手段とを備えている。

【0023】上記第2の目的を達成するため、請求項7記載の文書方向自動補正装置では、請求項6記載の前記判別手段は、前記文字認識辞書を参照して前記入力された画像データ中の文字データについて複数の方向から文字認識を行い、文字認識の精度値が高い文字に係る文字認識方向を文書方向として判別するように構成されている。

【0024】上記第2の目的を達成するため、請求項8記載の文書方向自動補正装置では、請求項6記載の前記判別手段は、前記入力された画像データの中から文字領域を抽出し、抽出した文字領域中の複数の文字データについて夫々複数の方向から文字認識を行い、該文字認識結果に基づいて文書方向を判別するように構成されている。

【0025】上記第2の目的を達成するため、請求項9

記載の文書方向自動補正装置では、請求項6記載の前記判別手段は、前記入力された画像データの中から文字領域を抽出し、抽出した文字領域中の複数の文字データについて夫々複数の方向から文字認識を行い、複数の文字の文字認識の精度値の方向別の平均値が最も大きい方向を文書方向として判別するように構成されている。

【0026】上記第2の目的を達成するため、請求項10記載の文書方向自動補正装置では、請求項6記載の前記判別手段は、前記入力された画像データの中から複数の文字領域を抽出し、抽出した複数の文字領域中の複数の文字データについて夫々複数の方向から文字認識を行い、文字領域別に複数の文字の方向別の文字認識の精度値の平均値を求め、さらに各文字領域における前記方向別の平均値の平均値を求め、該平均値の平均値が最も大きい方向を文書方向として判別するように構成されている。

【0027】上記第2の目的を達成するため、請求項11記載の文書方向自動補正装置では、請求項6～10記載の前記補正手段は、前記入力された画像データを全体的に回転することにより該画像データが正方向となるように補正するよう構成されている。

【0028】上記第2の目的を達成するため、請求項12記載の文書方向自動補正装置では、請求項6～10記載の前記補正手段は、前記入力された画像データのうちの文字領域だけを文字領域単位で回転することにより各文字データが正方向となるように補正するよう構成されている。

【0029】上記第2の目的を達成するため、請求項13記載の文書方向自動補正装置では、請求項6～10記載の前記補正手段は、前記入力された画像データのうちの文字データを個別に回転する形で脱出することにより各文字データが正方向となるように補正するよう構成されている。

【0030】

【作用】請求項1記載の文書方向自動判別装置では、前記判別手段は、前記文字認識辞書を参照して前記画像入力手段により入力された画像データ中の文字データについて複数の方向から文字認識を行い、該文字認識結果に基づいて文書方向を判別することにより、文書（文書画像）の方向を自動的に高精度に判別する。

【0031】請求項2記載の文書方向自動判別装置では、請求項1記載の前記判別手段は、前記文字認識辞書を参照して前記入力された画像データ中の文字データについて複数の方向から文字認識を行い、文字認識の精度値が最も高い文字に係る文字認識方向を文書方向として判別することにより、請求項1と同様の作用・効果が得られるようにする。

【0032】請求項3記載の文書方向自動判別装置では、請求項1記載の前記判別手段は、前記判別手段は、前記入力された画像データの中から文字領域を抽出し、

抽出した文字領域中の複数の文字データについて夫々複数の方向から文字認識を行い、該文字認識結果に基づいて文書方向を判別することにより、請求項1と同様の作用・効果が得られるようにする。

【0033】請求項4記載の文書方向自動判別装置では、請求項1記載の前記判別手段は、前記入力された画像データの中から文字領域を抽出し、抽出した文字領域中の複数の文字データについて夫々複数の方向から文字認識を行い、複数の文字の文字認識の精度値の方向別の平均値が最も大きい方向を文書方向として判別することにより、請求項1と同様の作用・効果が得られるようにする。

【0034】請求項5記載の文書方向自動判別装置では、請求項1記載の前記判別手段は、前記入力された画像データの中から複数の文字領域を抽出し、抽出した複数の文字領域中の複数の文字データについて夫々複数の方向から文字認識を行い、文字領域別に複数の文字の方向別の文字認識の精度値の平均値を求め、さらに各文字領域における前記方向別の平均値の平均値を求め、該平均値の平均値が最も大きい方向を文書方向として判別することにより、請求項1と同様の作用・効果が得られるようにする。

【0035】請求項6記載の文書方向自動補正装置では、前記判別手段は、前記文字認識結果を参照して前記画像入力手により入力された画像データ中の文字データについて複数の方向から文字認識を行い、該文字認識結果に基づいて文書方向を判別し、前記補正手段は、前記判別手段により文書方向が正方向でないとして判別された場合、少なくとも前記画像入力手段により入力された文字データが正方向となるように補正することにより、文書（文書画像）の方向を自動的に高精度に判別して補正する。

【0036】請求項7記載の文書方向自動補正装置では、請求項6記載の前記判別手段は、前記文字認識結果を参照して前記入力された画像データ中の文字データについて複数の方向から文字認識を行い、文字認識の精度値が最も高い文字に係る文字認識方向を文書方向として判別することにより、請求項6と同様の作用・効果が得られるようにする。

【0037】請求項8記載の文書方向自動補正装置では、請求項6記載の前記判別手段は、前記入力された画像データの中から文字領域を抽出し、抽出した文字領域中の複数の文字データについて夫々複数の方向から文字認識を行い、該文字認識結果に基づいて文書方向を判別することにより、請求項6と同様の作用・効果が得られるようにする。

【0038】請求項9記載の文書方向自動補正装置では、請求項6記載の前記判別手段は、前記入力された画像データの中から文字領域を抽出し、抽出した文字領域中の複数の文字データについて夫々複数の方向から文字

認識を行い、複数の文字の文字認識の精度値の方向別の平均値が最も大きい方向を文書方向として判別することにより、請求項6と同様の作用・効果が得られるようにする。

【0039】請求項10記載の文書方向自動補正装置では、請求項6記載の前記判別手段は、前記入力された画像データの中から複数の文字領域を抽出し、抽出した複数の文字領域中の複数の文字データについて夫々複数の方向から文字認識を行い、文字領域別に複数の文字の方向別の文字認識の精度値の平均値を求め、さらに各文字領域における前記方向別の平均値の平均値を求め、該平均値の平均値が最も大きい方向を文書方向として判別することにより、請求項6と同様の作用・効果が得られるようにする。

【0040】請求項11記載の文書方向自動補正装置では、請求項6～10記載の前記補正手段は、前記入力された画像データを全体的に回転することにより該画像データが正方向となるように補正することにより、請求項6と同様の作用・効果が得られるようにする。

【0041】請求項12記載の文書方向自動補正装置では、請求項6～10記載の前記補正手段は、前記入力された画像データのうちの文字領域だけを文字領域単位で回転することにより各文字データが正方向となるように補正することにより、請求項6と同様の作用・効果が得られるようにする。

【0042】請求項13記載の文書方向自動補正装置では、請求項6～10記載の前記補正手段は、前記入力された画像データのうちの文字データを個別に回転する形で脱出することにより各文字データが正方向となるように補正することにより、請求項6と同様の作用・効果が得られるようにする。

【0043】

【実施例】以下、本発明の実施例を図面を参照しながら説明する。

【0044】図1は、本発明の実施例による文書方向自動判別装置、および文書方向自動補正装置を適用したデータ処理システムのシステム構成図であり、本システムは、画像の入力部と画像処理部を待ち、スキャナ装置、或いは複写機などに、インテリジェント入力装置、または単独の入力装置がI/Fを介してコンピュータと接続されてインテリジェント化されたシステムである。

【0045】スキャナ部1は、文書原稿を光学的に読取り、光電変換してデジタルの画像データとして入力する手段である。このスキャナ部1にオートフィードを取り付けられ、複数枚の原稿を連続入力することが可能である。CPU/メモリ部2は、各種制御を行うと共に、画像データを一時的に保存するためにある。

【0046】文字認識/方向判別部3は、文書の方向を一番正確に現しているのは文字であることに着目し、文書中の数種類の文字領域を 0° 、 90° 、 180° 、 2

70°の方向から文字認識を行い、それら各方向における文字認識の精度(文字認識の自信度:文字の特徴分布に対する距離)の中で一番精度の高い方向を文書方向とする。

【0047】領域分離部4は、文字認識/方向判別部3による文字認識・方向判別処理を行うための前処理として、文書画像データより、文字部、図形部、自然画部、表部などを矩形的領域に分離して、各領域の属性(文字部など)を付加する処理を行うブロックである。

【0048】記憶装置5は、例えば、ハードディスクや光磁気ディスクなどにより構成され、各種処理結果(画像データ、領域分離結果、文字認識結果など)を保存するために利用される。I/F部6は、SCSIやRS232Cなどにより構成され、外部ヘッダを伝送するために設けられている。コンピュータは、I/F部6を介して情報を得たり、光磁気ディスク等の移動可能な記憶装置よりデータを得て利用する。プリンタ部8は、スキャナ部1から入力された画像データに対して、領域分離情報と文字認識情報に基づいて各種加工された画像データ等を印刷出力する。

【0049】次に、本実施例における文書方向自動判別・補正、および文字認識処理の概要を図2のフローチャートに従って説明する。

【0050】スキャナ部1により入力された画像データ(2値画像あるいは多値画像)は、まず領域分離部4により、文字部、図形部、自然画部、表部などの属性別に矩形的領域に分離される(ステップS1、S2)。ここでは、実際には、矩形で囲まれた領域情報を作成する。

【0051】次に、各属性より文字領域の矩形情報を抽出する(ステップS3)。ここで、文字領域とは、文章部、タイトル部、表中の文字、図のキャプション部などである。例えば、図3(a)、(c)の文書の場合は、それぞれ図3(b)、(d)に示したような文字領域の矩形情報が抽出される。そして、これらの中の数ブロックを用いて、文書方向判別を行う(ステップS4)。その結果、文書方向が正方向であれば、引続き画像中の文字ブロックに対して文字認識処理を行う(ステップS7)。

【0052】一方、文書方向が不正方向であれば、画像データを正しい方向に回転させる(ステップS5)。そして、回転画像に対して領域分離を行い、領域分離情報の補正処理を行う(ステップS6)。これは、画像回転に伴う領域分離情報の相違を補正するもので、一つの方法としては、全回転画像データに対して再び領域分離処理を行う方法。もう一つは、アドロン変換を領域分離結果にける方法がある。領域分離処理は、一般に画像が正方向を想定しているため、初期の段階で行った領域分離処理と回転画像データに対して行った領域分離処理は、結果が異なることが多い。それゆえ、前者の方法がとられるのが望ましい。

【0053】次に、ステップS7に進んで、回転画像データ中の文字領域ブロックは、文字認識処理系で文字認識される。この結果、最終的に、回転なし/回転ありの両方の場合とも、領域分離情報と文字認識情報が得られる(ステップS8)。

【0054】この処理結果は、I/F部6を介してコンピュータ7に伝送され、コンピュータ7上のファイリングのアプリケーションソフト等で利用される。また、記憶装置5に転送する系では、連続的に画像情報を入力して、次に、その情報をまとめて読出すといったバッチ処理的に使用する方式に利用される。さらにプリンタ8に転送する系では、プリンタ8にページ記述言語を解釈する機能がある場合には、文字認識と領域分離の処理により逆PDL(画像データよりページ記述言語を作成する方法)で文書を再構成したり消書きしたりするのに利用される。

【0055】次に、文字認識処理を用いた文書方向判別の手法について説明する。

【0056】【領域分離処理】文書画像データの黒画素を検出してゆき、輪郭線追跡、またはラベリング方式により、黒画素ブロックの矩形を作成する。次に、その矩形のなかの黒画素密度、隣接矩形ブロックの有無、矩形の縦横比率などを判断基準にして、文字領域(タイトル、本分、キャプションなど)、図形領域、自然画領域、表領域などを判別する。この処理結果より、文字領域の矩形情報が判別される。

【0057】【文字認識処理】文字認識処理の一つの方法として、特徴ベクトル抽出、比較方式がある。例えば図4(a)に示したように、「本」という文字を含む文字領域が判別されたとする。第一段階として、この文字領域について文字切り出し処理を行う(図4(b)参照)。これは、一つの文字の矩形を切り出す処理で、黒画素連続性の状態を検出していけば求められる。第二段階として、一文字を $m \times n$ (例えば 6×4)の画素ブロックに切り出す(図4(c)参照)。そして、その中から 3×3 画素のウィンドウを用いて、黒画素の分布画像を抽出する(方向ベクトル情報:図4(d)参照)。

【0058】なお、図4(d)は、方向ベクトル情報の一部を例示したものであり、上記 3×3 画素のウィンドウをずらしてゆき、方向ベクトル情報を数個得る。このベクトル情報が文字の特徴となる。この特徴ベクトルと予め記憶されている文字認識辞書の内容とを比較して、特徴ベクトルに一番近い文字から順次に文字を抽出する。この場合、特徴ベクトルに特徴が近い順番が第1候補、第2候補、第3候補、...となる。この特徴ベクトルに対する特徴の近さが、その文字に対する距離の近さ、すなわち文字認識の自信度(精度)という数値となる。

【0059】【文字方向判別処理】このようにして文字

認識の自信度が求められるが、その自信度に基づいた文字方向判別処理を、図5に示した「本発明の名称」という例を用いて説明する。

【0060】図5(a)は正方向の文、図5(b)は270°回転した文である。ここで「本」に注目すると、文字方向を判別する場合は、図5(c)に示したように、1つの文字「本」について0°、90°、180°、270°の4方向から文字認識を行ってみる。各回転角度は、文字矩形の領域の読出し方を変更すればよく、特に原像を回転する必要はない。

【0061】各回転角度における文字認識結果は、図5(c)に示したように、互いに異なっている。なお、図5(c)には、説明用の仮の文字認識結果および自信度が示されており、現実にはこの通りになるとは限らない。

【0062】図5(c)において、正方向(0°)から文字認識を行った場合は、「本」と正しく認識され、自信度も0.90と高い値となる。90°回転した方向から文字認識を行った場合は、「町」と誤認識され、自信度も0.40と低下する。このように誤認識が発生し、自信度も低下するのは、回転した方向から見た場合の特徴ベクトルに基づいて文字認識を行ったからである。同様に180°、270°回転した方向から文字認識を行った場合も、誤認識が発生し、自信度も低下する。なお、文字認識の方向別の自信度は、複雑な文字であればある程、その差が顕著に現れてくる。

【0063】図5(c)の結果は、正方向の場合に自信度が1番高いため、文書は正方向に向いている可能性が高いと判断される。文字方向判別の精度を向上させるため、同一ブロック内の複数の文字について、同様に4方向から文字認識を行ってみる。さらに、1つのブロックだけで文字方向を判別した場合、特殊な文字列について文字方向を誤って判別する点があるので、複数のブロックについて同様の文字認識を行ってみる。

【0064】そして、各ブロックについて、当該ブロック内の各認識対象文字の4方向別の自信度の平均値を求め、さらに、各ブロックでの4方向別の自信度の平均値に対する平均値を求め、この平均値が最も高い方向を文字方向(文書方向)として認定する。

【0065】このように、1文字だけの自信度で文字方向を認定することなく、同一ブロック内の複数の文字、さらには同一ブロック内の複数の文字の自信度で文字方向を認定することにより、文字(文書)方向を高精度に判別することが可能となる。ただし、1文字だけの自信度で文字方向を判別したり、あるいは同一ブロック内の複数の文字の自信度で文字方向を判別しても、従来よりも高精度に文字方向を判別できることは言うまでもない。

【0066】次に、文字方向(文書方向)の判別結果が、正方向以外の方向であるときは、文字方向が正方向になるように原画像を回転する。この回転は、図1のCPU/メモリ2を用いて公知の技術により簡単にいうこ

とが可能であり、その説明は省略する。

【0067】以上のような、処理により、図6(a)に示した原画像データ、図6(b)に示した領域分離データ、図6(c)に示した文字認識情報を得ることができる。これらの情報は、前述のように、電子ファインダ、文書整形、DTPなどのアプリケーションにより使用される。

【0068】領域分離データの形式は、図6(b)に示したように、領域分離データである旨を示す「header」と、分離した領域の識別子「rect1」～「rectn4」により構成され、この識別子で区別された各領域(ブロック)の情報は、ブロックの番号「order」、ブロックの属性(文字部、図形部など)「attribute」、ブロックの左上の座標値「x1」および「y1」、ブロックの幅「w」、ブロックの高さ「h」、縦書き、または横書きを示す「direction」、当該ブロックのIDである「SelfID」、当該ブロックを包含する親ブロックのIDである「upperID」、親ブロックの属性「upperAttribute」、予備領域「reserve」により構成されている。

【0069】また、文字認識情報は、図6(c)に示したように、文字認識情報である旨を示す「header」を有し、例えば「本」等の単一の文字に関する文字認識情報「OCR1」等と、当該文字が含まれているブロックを示す上記「rect1」等に相当する「blkheader」との組み合わせ情報により構成されている。

【0070】そして、「OCR1」等の各文字認識情報は、文字であるか或いは空白であるかを示す「type」、前述の文字認識の自信度に従った第1～第5候補文字「文字1」～「文字5」、当該文字の切出し位置「x1」および「y1」、当該文字の幅「w」、当該文字の高さ「h」、予備領域「reserve」により構成されている。

【0071】【他の実施例】なお、上記実施例では、文書方向を判別した結果、正方向を向いておらず回転すべき場合には、原画像データ全体を回転させて文字認識を行っていたが、原画像データを回転せずに文字認識を行うことも可能である。

【0072】この場合には、文字領域の矩形情報を得た後、図7に示したように、文字矩形領域に対して文字切りを行い、各文字を読出す際に読出方向を回転させた状態で読出して文字認識を行ってもよい(図9のステップS9参照)。

なお、図9のフローチャートは、他のステップは、図1とほぼ同様なので、同一のステップ番号を付けるだけで、その説明は省略する。

【0074】なお、本発明は上記各実施例に限定される

ことなく、例えば、日本語だけでなく、他の言語に係る文書にも通用可能である。特に、英語等に係る文書は、縦書き文書がないため、文書方向をより高精度に判別することが可能である。

【0075】

【発明の効果】以上、詳細に説明したように、本発明によれば、文書の方向を一番正確に現しているのは文字であることに着目して、同一文字について複数の方向から文字認識を行い、文字認識精度の一番高い方向を文書方向として判別し、その判別結果に基づいて必要に応じて文書方向を補正するようにしたので、文書（文書画像）の方向を自動的に高精度に判別し、また文書方向を補正することができ、人手を介さずに高精度な文字認識結果を得ることが可能となる。

【図面の簡単な説明】

【図1】本発明の実施例による文書方向自動判別装置および文書方向自動補正装置を適用したデータ処理システムのシステム構成図である。

【図2】本発明の実施例による文書方向自動判別・補正、および文字認識処理を示すフローチャートである。

【図3】領域分離状態を示した図である。

【図4】文字認識処理の処理過程を説明するための説明図である。

【図5】文書（文字）方向判別処理を説明するための説明図である。

* 【図6】領域分離および文字認識情報のデータ形式を示した図である。

【図7】他の実施例を説明するための説明図である。

【図8】図7とは異なる他の実施例を説明するための説明図である。

【図9】図8の他の実施例に係る文書方向自動判別・補正、および文字認識処理を示すフローチャートである。

【図10】同一文字に対する方向別の文字認識結果を示した図である。

【図11】各種文書の文字方向等の形式を示した図である。

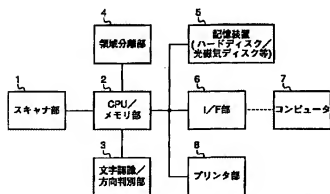
【図12】文書をモニタ表示した場合の問題点をせつめいするたけの説明図である。

【図13】従来の文書方向判別手法を説明するための説明図である。

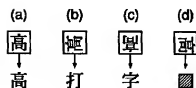
【符号の説明】

- 1…スキャナ部
- 2…CPU/メモリ部
- 3…文字認識/方向判別部
- 4…領域分離部
- 5…記憶装置
- 6…I/F部
- 7…コンピュータ
- 8…プリンタ部

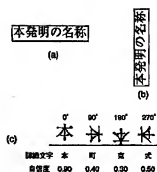
【図1】



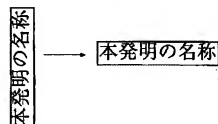
【図10】



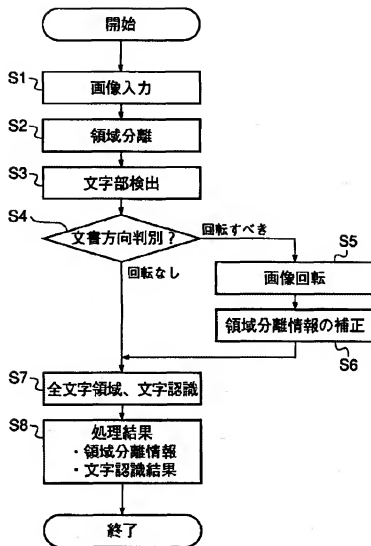
【図5】



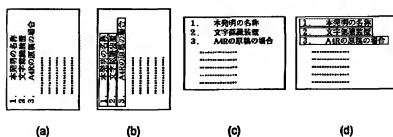
【図7】



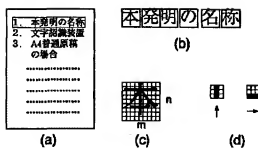
【図2】



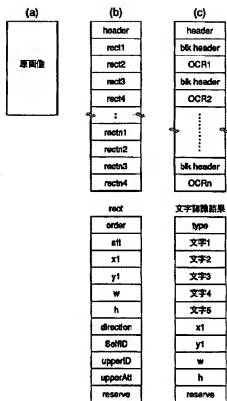
【図3】



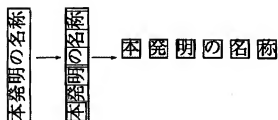
【図4】



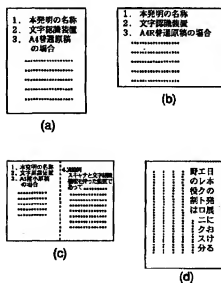
【図6】



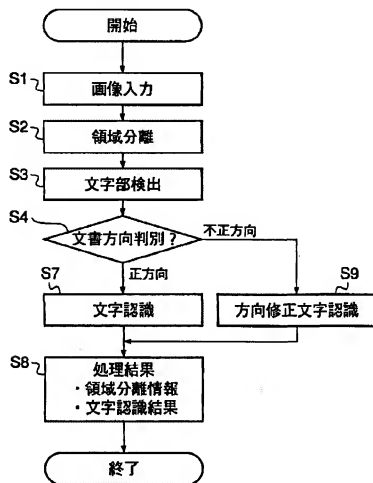
【図8】



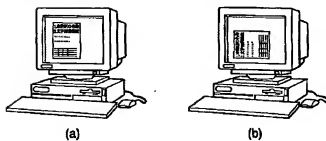
【図11】



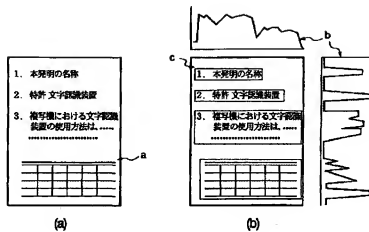
【図 9】



【図 12】



【図 13】



【公報種別】特許法第17条の2の規定による補正の掲載

【部門区分】第6部門第3区分

【発行日】平成14年4月26日(2002.4.26)

【公開番号】特開平8-212298

【公開日】平成8年8月20日(1996.8.20)

【年通号数】公開特許公報8-2123

【出願番号】特願平7-36079

【国際特許分類第7版】

G06K 9/46

9/03

【F1】

G06K 9/46

A

9/03

C

【手続補正書】

【提出日】平成14年1月28日(2002.1.28)

【手続補正1】

【補正対象書類名】明細書

【補正対象項目名】発明の名称

【補正方法】変更

【補正内容】

【発明の名称】 文書処理装置、及び文書処理方法

【手続補正2】

【補正対象書類名】明細書

【補正対象項目名】特許請求の範囲

【補正方法】変更

【補正内容】

【特許請求の範囲】

【請求項1】 文字認識に用いる文字認識辞書と、
該文字認識辞書を参照して、入力された文書画像データ
中の文字データについて複数の方向から文字認識処理を
行い、該文字認識処理の結果に基づいて該文書画像の文
書方向を判別する判別手段と、
を備えたことを特徴とする文書処理装置。

【請求項2】 前記判別手段は、前記複数の方向からの
文字認識処理それぞれの結果から、文字認識の精度値が
最も高くなった方向を、該文書画像の文書方向として判
別することを特徴とする請求項1記載の文書処理装置。

【請求項3】 前記判別手段は、前記入力された文書画
像データの中から文字領域を抽出し、該抽出した文字領
域中の複数の文字データについて夫々複数の方向から文
字認識処理を行い、該複数の文字の文字認識処理結果に
基づいて該文書画像の文書方向を判別することを特徴と
する請求項1記載の文書処理装置。

【請求項4】 前記判別手段は、前記入力された文書画
像データの中から文字領域を抽出し、該抽出した文字領
域中の複数の文字データについて夫々複数の方向から文
字認識処理を行い、該複数の文字の文字認識処理結果に

基づいて精度値の方向別の平均値が最も大きい方向を、
該文書画像の文書方向として判別することを特徴とする
請求項3記載の文書処理装置。

【請求項5】 前記判別手段は、前記入力された画像デ
ータの中から複数の文字領域を抽出し、該抽出した複数
の文字領域それぞれに対して、複数の文字データについ
て夫々複数の方向から文字認識処理を行い、文字領域別
に文字認識精度値の方向別平均値を求め、さらに、前記
各文字領域で求めた方向別平均値の平均を求め、該方向
別平均値の平均が最も大きい方向を文書方向として判別
することを特徴とする請求項1記載の文書処理装置。

【請求項6】 更に、前記判別手段により該文書画像の
文書方向が正方向でないとは判別された場合、少なくとも
前記判別手段により判別に用いられた文字データの方向
が正方向となるように補正する補正手段を備えたことを
特徴とする請求項1記載の文書処理装置。

【請求項7】 前記補正手段は、前記入力された文書画
像データを全体的に回転することにより、該文書画像デ
ータが正方向となるように補正することを特徴とする請
求項6記載の文書処理装置。

【請求項8】 前記補正手段は、前記入力された文書画
像データのうち文字領域だけを文字領域単位で回転する
ことにより各文字データが正方向となるように補正する
ことを特徴とする請求項6記載の文書処理装置。

【請求項9】 前記補正手段は、前記入力された文書画
像データのうち文字データを個別に回転する形で読出す
ことにより各文字データが正方向となるように補正する
ことを特徴とする請求項6記載の文書処理装置。

【請求項10】 更に、前記補正手段により補正された
文字データに対して文字認識処理を行う文字認識処理手
段を備えることを特徴とする請求項6記載の文書処理装
置。

【請求項11】 前記判別手段における文字認識処理
は、前記文字認識辞書に格納されている文字の特徴ベク

トルと、該入力された文書画像データから得られる文字データの特徴ベクトルとを用いて行われることを特徴とする請求項1記載の文書処理装置。

【請求項12】 文字認識辞書を参照して、入力された文書画像データ中の文字データについて複数の方向から文字認識処理を行い、該文字認識処理の結果に基づいて該文書画像の文書方向を判別する判別ステップを有することを特徴とする文書処理方法。

【請求項13】 更に、前記判別ステップで該文書画像の文書方向が正方向でないと判別された場合、少なくとも前記判別手段により判別に用いられた文字データの方向が正方向となるように補正する補正ステップを備えたことを特徴とする請求項12記載の文書処理方法。

【手続補正3】

【補正対象書類名】明細書

【補正対象項目名】0001

【補正方法】変更

【補正内容】

【0001】

【産業上の利用分野】本発明は、CCD等の光電変換素子により読取られた文書（文書画像）の方向を自動的に判別する文書処理装置、及び文書処理方法に関する。

【手続補正4】

【補正対象書類名】明細書

【補正対象項目名】0015

【補正方法】変更

【補正内容】

【0015】本発明は、このような背景の下になされたもので、その第1の目的は、文書（文書画像）の方向を自動的に高精度に判別できるようにすることにある。

【手続補正5】

【補正対象書類名】明細書

【補正対象項目名】0016

【補正方法】変更

【補正内容】

【0016】本発明の第2の目的は、文書（文書画像）の方向を自動的に高精度に判別して補正できるようにすることにある。

【手続補正6】

【補正対象書類名】明細書

【補正対象項目名】0017

【補正方法】変更

【補正内容】

【0017】

【課題を解決するための手段】上記第1の目的を達成するため、請求項1記載の文書処理装置は、文字認識に用いる文字認識辞書と、該文字認識辞書を参照して、入力された文書画像データ中の文字データについて複数の方向から文字認識処理を行い、該文字認識処理の結果に基づいて該文書画像の文書方向を判別する判別手段とを備

えている

【手続補正7】

【補正対象書類名】明細書

【補正対象項目名】0018

【補正方法】変更

【補正内容】

【0018】上記第1の目的を達成するため、請求項2記載の文書処理装置では、請求項1記載の前記判別手段は、前記複数の方向からの文字認識処理それぞれの結果から、文字認識の精度値が最も高くなった方向を、該文書画像の文書方向として判別するように構成されている。

【手続補正8】

【補正対象書類名】明細書

【補正対象項目名】0019

【補正方法】変更

【補正内容】

【0019】上記第1の目的を達成するため、請求項3記載の文書処理装置では、請求項1記載の前記判別手段は、前記入力された文書画像データの中から文字領域を抽出し、該抽出した文字領域中の複数の文字データについて夫々複数の方向から文字認識処理を行い、該複数の文字の文字認識処理結果に基づいて該文書画像の文書方向を判別するように構成されている。

【手続補正9】

【補正対象書類名】明細書

【補正対象項目名】0020

【補正方法】変更

【補正内容】

【0020】上記第1の目的を達成するため、請求項4記載の文書処理装置では、請求項3記載の前記判別手段は、前記入力された文書画像データの中から文字領域を抽出し、該抽出した文字領域中の複数の文字データについて夫々複数の方向から文字認識処理を行い、該複数の文字の文字認識処理結果に基づいて精度値の方向別の平均値が最も大きい方向を、該文書画像の文書方向として判別するように構成されている。

【手続補正10】

【補正対象書類名】明細書

【補正対象項目名】0021

【補正方法】変更

【補正内容】

【0021】上記第1の目的を達成するため、請求項5記載の文書処理装置では、請求項1記載の前記判別手段は、前記入力された画像データの中から複数の文字領域を抽出し、該抽出した複数の文字領域それぞれに対して、複数の文字データについて夫々複数の方向から文字認識処理を行い、文字領域別に文字認識精度値の方向別平均値を求め、さらに、前記各文字領域で求めた方向別平均値の平均を求め、該方向別平均値の平均が最も大き

い方向を文書方向として判別するように構成されている。

【手続補正11】

【補正対象書類名】明細書

【補正対象項目名】0022

【補正方法】変更

【補正内容】

【0022】上記第2の目的を達成するため、請求項6記載の文書処理装置は、更に、請求項1記載の前記判別手段により文書画像の文書方向が正方向でないと判別された場合、少なくとも前記判別手段により判別に用いられた文字データの方向が正方向となるように補正する補正手段を備えている。

【手続補正12】

【補正対象書類名】明細書

【補正対象項目名】0023

【補正方法】変更

【補正内容】

【0023】上記第2の目的を達成するため、請求項7記載の文書処理装置では、請求項6記載の前記補正手段は、前記入力された文書画像データを全体的に回転することにより、該文書画像データが正方向となるように補正している。

【手続補正13】

【補正対象書類名】明細書

【補正対象項目名】0024

【補正方法】変更

【補正内容】

【0024】上記第2の目的を達成するため、請求項8記載の文書処理装置では、請求項6記載の前記補正手段は、前記入力された文書画像データのうち文字領域だけを文字領域単位で回転することにより各文字データが正方向となるように補正するように構成されている。

【手続補正14】

【補正対象書類名】明細書

【補正対象項目名】0025

【補正方法】変更

【補正内容】

【0025】上記第2の目的を達成するため、請求項9記載の文書処理装置では、請求項6記載の前記補正手段は、前記入力された文書画像データのうち文字データを個別に回転する形で認出すことにより各文字データが正方向となるように補正するよう構成されている。

【手続補正15】

【補正対象書類名】明細書

【補正対象項目名】0026

【補正方法】変更

【補正内容】

【0026】上記第2の目的を達成するため、請求項10記載の文書処理装置では、更に、請求項6記載の前記

補正手段により補正された文字データに対して文字認識処理を行う文字認識処理手段を備えている。

【手続補正16】

【補正対象書類名】明細書

【補正対象項目名】0027

【補正方法】変更

【補正内容】

【0027】上記第1の目的を達成するため、請求項11記載の文書処理装置では、請求項1記載の前記判別手段における文字認識処理は、前記文字認識辞書に格納されている文字の特徴ベクトルと、該入力された文書画像データから得られる文字データの特徴ベクトルとを用いて行われるように構成されている。

【手続補正17】

【補正対象書類名】明細書

【補正対象項目名】0028

【補正方法】変更

【補正内容】

【0028】上記第1の目的を達成するため、請求項12記載の文書処理方法は、文字認識辞書を参照して、入力された文書画像データ中の文字データについて複数の方向から文字認識処理を行い、該文字認識処理の結果に基づいて該文書画像の文書方向を判別する判別ステップを有している。

【手続補正18】

【補正対象書類名】明細書

【補正対象項目名】0029

【補正方法】変更

【補正内容】

【0029】上記第2の目的を達成するため、請求項13記載の文書処理方法は、更に、請求項12記載の前記判別ステップで該文書画像の文書方向が正方向でない判別された場合、少なくとも前記判別手段により判別に用いられた文字データの方向が正方向となるように補正する補正ステップを備えている。

【手続補正19】

【補正対象書類名】明細書

【補正対象項目名】0030

【補正方法】変更

【補正内容】

【0030】

【作用】請求項1記載の文書処理装置では、前記判別手段は、文字認識に用いる文字認識辞書と、該文字認識辞書を参照して、入力された文書画像データ中の文字データについて複数の方向から文字認識処理を行い、該文字認識処理の結果に基づいて該文書画像の文書方向を判別することにより、文書（文書画像）の方向を自動的に高精度に判別する。

【手続補正20】

【補正対象書類名】明細書

【補正対象項目名】0031

【補正方法】変更

【補正内容】

【0031】請求項2記載の文書処理装置では、請求項1記載の前記判別手段は、前記複数の方向からの文字認識処理それぞれの結果から、文字認識の精度値が最も高くなった方向を、該文書画像の文書方向として判別することにより、請求項1と同様の作用・効果が得られるようにする。

【手続補正21】

【補正対象書類名】明細書

【補正対象項目名】0032

【補正方法】変更

【補正内容】

【0032】請求項3記載の文書処理装置では、請求項1記載の前記判別手段は、前記入力された文書画像データの中から文字領域を抽出し、該抽出した文字領域中の複数の文字データについて夫々複数の方向から文字認識処理を行い、該複数の文字の文字認識処理結果に基づいて該文書画像の文書方向を判別することにより、請求項1と同様の作用・効果が得られるようにする。

【手続補正22】

【補正対象書類名】明細書

【補正対象項目名】0033

【補正方法】変更

【補正内容】

【0033】請求項4記載の文書処理装置では、請求項3記載の前記判別手段は、前記入力された文書画像データの中から文字領域を抽出し、該抽出した文字領域中の複数の文字データについて夫々複数の方向から文字認識処理を行い、該複数の文字の文字認識処理結果に基づいて精度値の方向別の平均値が最も大きい方向を、該文書画像の文書方向として判別することにより、請求項1と同様の作用・効果が得られるようにする。

【手続補正23】

【補正対象書類名】明細書

【補正対象項目名】0034

【補正方法】変更

【補正内容】

【0034】請求項5記載の文書処理装置では、請求項1記載の前記判別手段は、前記入力された画像データの中から複数の文字領域を抽出し、該抽出した複数の文字領域それぞれに対して、複数の文字データについて夫々複数の方向から文字認識処理を行い、文字領域別に文字認識精度値の方向別平均値を求め、さらに、前記各文字領域で求めた方向別平均値の平均を求め、該方向別平均値の平均が最も大きい方向を文書方向として判別することにより、請求項1と同様の作用・効果が得られるようにする。

【手続補正24】

【補正対象書類名】明細書

【補正対象項目名】0035

【補正方法】変更

【補正内容】

【0035】請求項6記載の文書処理装置では、前記補正手段は、請求項1記載の前記判別手段により文書画像の文書方向が正方向でないとは判別された場合、少なくとも前記判別手段により判別に用いられた文字データの方向が正方向となるように補正することにより、文書（文書画像）の方向を自動的に高精度に判別して補正する。

【手続補正25】

【補正対象書類名】明細書

【補正対象項目名】0036

【補正方法】変更

【補正内容】

【0036】請求項7記載の文書処理装置では、請求項6記載の前記補正手段は、前記入力された文書画像データを全体的に回転することにより、該文書画像データが正方向となるように補正することにより、請求項6と同様の作用・効果が得られるようにする。

【手続補正26】

【補正対象書類名】明細書

【補正対象項目名】0037

【補正方法】変更

【補正内容】

【0037】請求項8記載の文書処理装置では、請求項6記載の前記補正手段は、前記入力された文書画像データのうち文字領域だけを文字領域単位で回転することにより各文字データが正方向となるように補正することにより、請求項6と同様の作用・効果が得られるようにする。

【手続補正27】

【補正対象書類名】明細書

【補正対象項目名】0038

【補正方法】変更

【補正内容】

【0038】請求項9記載の文書処理装置では、請求項6記載の前記補正手段は、前記入力された文書画像データのうち文字データを個別に回転する形で設出することにより各文字データが正方向となるように補正するように構成され、請求項6と同様の作用・効果が得られるようにする。

【手続補正28】

【補正対象書類名】明細書

【補正対象項目名】0039

【補正方法】変更

【補正内容】

【0039】請求項10記載の文書処理装置では、更に、請求項6記載の前記補正手段により補正された文字データに対して文字認識処理を行う文字認識処理手段を

備えることにより、請求項 6 と同様の作用・効果が得られるようにする。

【手続補正 29】

【補正対象書類名】明細書

【補正対象項目名】0040

【補正方法】変更

【補正内容】

【0040】請求項 11 記載の文書処理装置では、請求項 1 記載の前記判別手段における文字認識処理は、前記文字認識辞書に格納されている文字の特徴ベクトルと、該入力された文書画像データから得られる文字データの特徴ベクトルとを用いて行われるように構成され、請求項 1 と同様の作用・効果が得られるようにする。

【手続補正 30】

【補正対象書類名】明細書

【補正対象項目名】0041

【補正方法】変更

【補正内容】

【0041】請求項 12 記載の文書処理方法は、文字認識辞書を参照して、入力された文書画像データ中の文字データについて複数の方向から文字認識処理を行い、該文字認識処理の結果に基づいて該文書画像の文書方向を判別する判別ステップを有し、請求項 1 と同様の作用・効果が得られるようにする。

【手続補正 31】

【補正対象書類名】明細書

【補正対象項目名】0042

【補正方法】変更

【補正内容】

【0042】請求項 13 記載の文書処理方法は、更に、請求項 12 記載の前記判別ステップで該文書画像の文書方向が正方向でないと判別された場合、少なくとも前記判別手段により判別に用いられた文字データの方向が正方向となるように補正する補正ステップを備え、請求項 6 と同様の作用・効果が得られるようにする。